The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LV
No. 1425

SATURDAY, AUGUST 17, 1946
REGISTERED AS A NEWSPAPER

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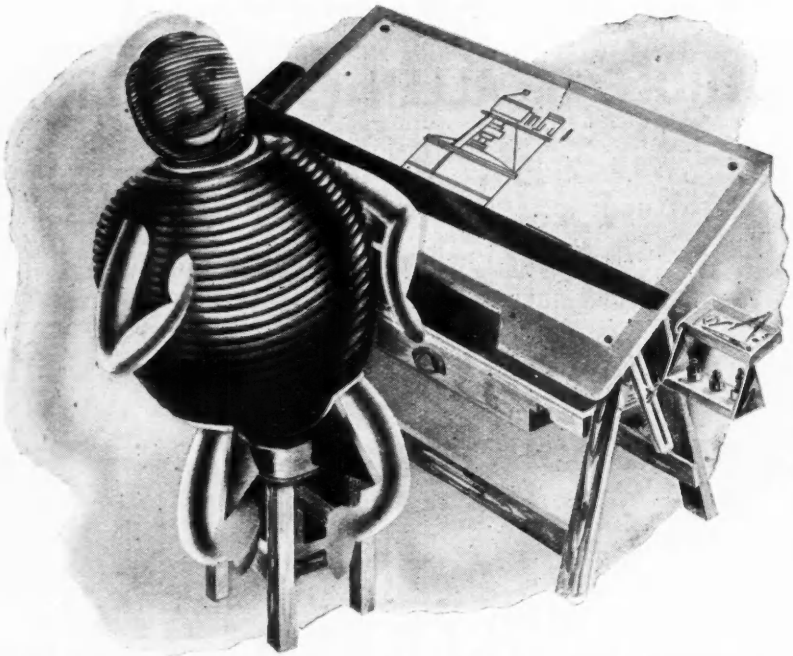

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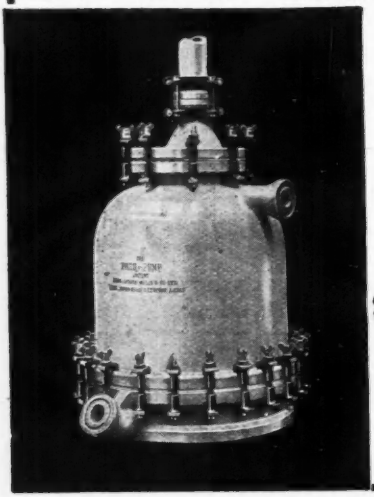

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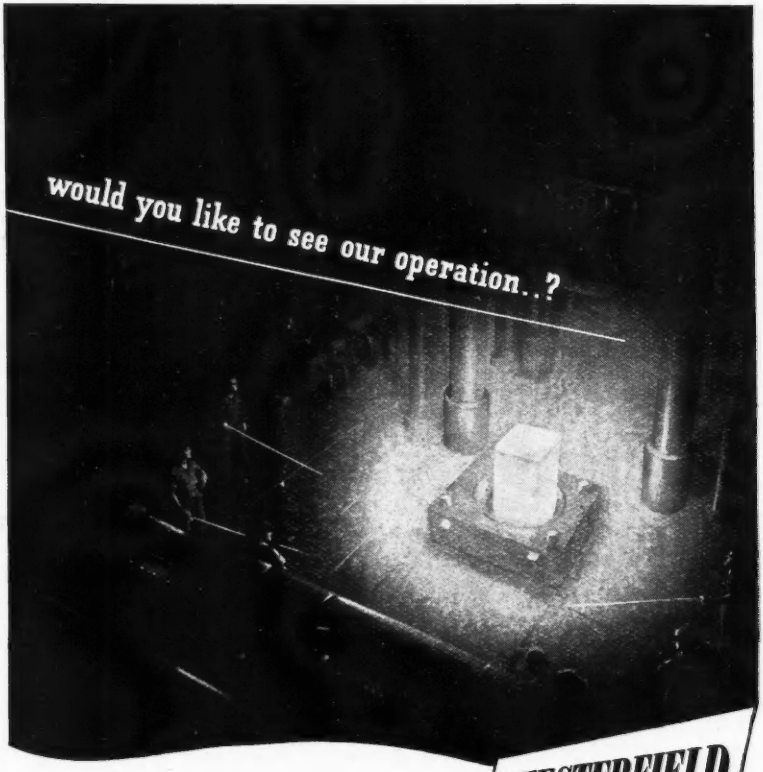

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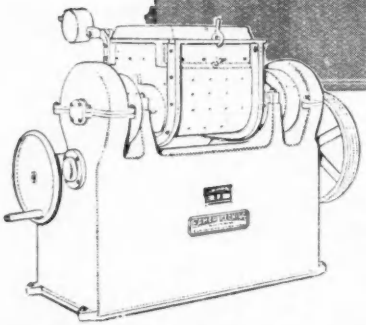

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited

VOL. LV
No. 1416.

August 17, 1946

Annual Subscription 21s.
Overseas 26s.

Fuel Oil

THE decision of the Chancellor of the Exchequer, prompted undoubtedly by the Minister of Fuel and Power, to bring to an end the tax on fuel oil, as recorded in our columns last week (p. 175), closes at least temporarily a chapter of rather unseemly wrangling between two great industries. So long as coal was cheap, competition from fuel oil was inappreciable. But as the oil industry developed, and the coal industry deteriorated during and after the 1914-18 war, the position changed. The coal industry found itself losing ground. The entry into industry of the profession of fuel technologist—an entry now happily consolidated by the recent grant of a Royal Charter to the Institute of Fuel—soon caused great firms who had been prodigal in their expenditure of coal to look towards fuel efficiency to reduce their working costs. This, coupled with a trade depression, made the colliery companies anxious about output. Unemployment became rife in the coalfields; profits dwindled and ultimately vanished. In these circumstances the Coal Utilisation Council was born. One of its chief objectives appeared to the unprejudiced observer to be the elimination of oil fuel from this country. Every possible means, including political action, was taken to this end. The result of the agitation by the coal industry before and after the formation of the C.U.C. was that the Government of the day established in 1933 a tax of a penny a gallon on all imported oil.

With the aid of this tax, the coal industry effectively met the competition of oil. The consumption of oil for fuel purposes, which had been rising steadily before that date, remained fairly stationary with, if anything, a tendency to decline. The reason for this was not only the tax as levied; it was the fear that the tax might be further increased. The present removal of the tax is a direct change of attitude on the part of the Government and the coal industry. With the nationalisation of the coal industry, the old fires of competition have died. The Minister has also to face the fact that unemployment has ceased in the coalfields, and that on the contrary there is grave doubt, as we have pointed out previously in these columns, whether we shall get through the next two winters without serious dislocation of industry due to coal shortage. Consequently, the Minister of Fuel and Power has looked round for another source of fuel, and has decided to introduce oil fuel in quantities as large as he can succeed in using.

The change-over can be made in two ways. There will be a certain

On Other Pages

number of coal-burning appliances that can change readily to fuel oil by replacement of the grates by oil-burning equipment. These will be the first objective, and here the replacement will involve no serious issues. Long-term replacement, however, is quite another matter. There are many furnaces and plants which cannot be changed from solid fuel to oil without complete rebuilding. Once a change is made, it is final over the length of life of the plant. Industry will naturally ask whether the removal of the oil tax is permanent, but to that there is at present no answer. The official announcement says that the removal of the tax will afford an appreciable relief against the higher operating costs of oil-burning plant compared with coal-burning plant and the Chancellor of the Exchequer hopes it will result in conversions from coal to oil to the maximum extent possible. Unless relief from the oil tax is promised for a stated period of years, it is unlikely that any major conversions will be made.

This problem demands handling in a new way. Fuel oil experts who know what is being done abroad declare that the use of oil has various advantages for industry. These advantages are, it is said, secured by the foreign manufacturer because he has access to unlimited oil and at a price much below ours. Among other things it is stated that steel in America is generally made, even in the coal areas, by the use of oil fuel in the open-hearth furnaces. The output of the furnaces is said to be increased and the quality of the steel improved. Increase in furnace output is an important step towards reduction in costs. The effect of cheaper steel in the competitive power of America and Britain in the export trade may well be serious. Thus, if the contentions of the oil industry are sound, the imposition of a tax on fuel oil may well handicap this country in the markets of the world. We are all in favour of free competition, and though competition is foreign to nationalisation, this move may well bring free competition into the fuel industries. There are many who believe that coal will hold its own through the use of town gas, which possesses the advantages of oil by comparison with coal in superabundant measure, but is likely to be dearer in initial price per therm delivered. The gas industry believes that the competition of oil can be met. But let us have competition. Let our nationalised industries face competition, for it is only in that way that they can hope to be kept alive at all.

The total quantity of oil fuel that is likely to be used in this country is not very great. The amount used for all burning and processing purposes at present is of the order of 1½ million tons a year, excluding shipping and Admiralty requirements. We doubt whether an additional million tons will be used this coming winter. We should not expect more than about 3,000,000 tons to be used at any time, though more optimistic statements have been known to be made. When oil and coal find their own level, it will be interesting to see where that level is, but it will be doubly interesting to discover whether the use of tax-free oil reduces the cost of manufacture of any goods to a significant extent.

The way in which the oil tax has been removed and the appeals to use oil for any and every purpose suggest that the Minister of Fuel and Power and the Government have become more than a little panic-stricken before the coal situation in the approaching winter—as well they might. But the problem needs to be considered on a long-term basis. It demands collaboration between the oil industry and the coal industry. That may seem to many to be asking for the moon; but have we not reached a stage at which these things are not only necessary but possible? Whence comes our oil? What do we have to pay for it abroad? Clearly some payment must be made outside the country even if it all comes from oilfields and refineries that we ourselves own through the Anglo-Iranian Oil Company and similar bodies. Commonsense suggests that we should use such oil only for those purposes for which it is really well suited. It would be foolish, for example, to import oil for use in central heating; it might be very desirable to import oil for use in the open-hearth steel furnace. We hope that some reasonable planned programme of fuel-oil utilisation will be adopted.

It will occur to many that the removal of the oil tax will bring nearer the home refining of oil. Care should be taken in adopting this view for the present. There are many difficulties in the way of home refining. Not the least is the uncertainty of the period for which the tax is to be removed. Let the Coal Board get into difficulties, and the Government will clap it on again as quickly as they have removed it!

NOTES AND COMMENTS

The B.A.C. Vote

A GENERAL ballot of members of the British Association of Chemists, as indicated in our issue of July 20 (p. 65), is to be taken on the proposal made by the Council of that Body to affiliate with the Trade Union Congress. That is a private matter for the B.A.C. into which it would be inappropriate to venture, were it not that the move involves a principle affecting the many chemists who are or may in the future be members of the B.A.C., and consequently is of general interest to the profession. We suggest that certain points might well be taken into account by members who are now recording their views on the ballot papers provided. The question of political or strike action, for example, is one of the most contentious in the whole discussion. The Council of the B.A.C. appears to believe that the T.U.C. is non-political. It is no doubt true that the T.U.C. is not financed from out of the political funds of its constituent unions. It is true that it cannot spend its funds on the promotion of Parliamentary candidates. It is true that the T.U.C. and the Labour Party are separate bodies. But it is also true that the T.U.C. is inevitably bound to discuss political matters and adopts resolutions stating its views: these resolutions are generally in line with the ideas of the Labour Party, and the T.U.C. and the Labour Party quite evidently travel along the same path, even though at times one may diverge to pick a flower that the other has not seen or does not want. We do not find, however, that affiliation with the T.U.C. need be resisted on these grounds.

Chemists and Strike Action

MORE serious is the demand on the part of the T.U.C. that its constituent unions must "work with and not against" the main body. This is quite understandable, but where does it lead us? It leads to the position that while an affiliated union would not be under obligation to take part in strike action on behalf of another union—though it might be morally difficult to avoid doing so—"in the event of any other union being involved in a strike, the B.A.C. would be expected not to act in any way against its members." No one expects chemists to act as strike breakers, but our own past experience has been that when a strike has been declared, certain parts of the works which cannot be readily stopped without injury are kept in operation by the aid of the staff. The chemists are not workmen; they are staff. It would be most detrimental to the profession if affiliation to the T.U.C. resulted in a refusal on the part of the chemists to carry out the normal duties necessary for keeping the plant from damage, which have always been the privilege and responsibility of the staff.

The Indignity of Compulsion

THE Council of the B.A.C. is apparently quite happy that although the Association may lose quite a number of members if it becomes affiliated, "it is doubtful if their number would be at all substantial." It is found that this loss might well be balanced by the many members who are becoming restive because they fear that what is projected is in fact coming to pass. The Association appears from this statement to be losing ground anyway, and the Council clearly feels that those who will go should go, and may possibly have gone already. Thus "it may well be that the B.A.C. is already experiencing this particular disadvantage of affiliation without getting the counter-advantages." Membership of the B.A.C. is an internal affair, with which we need not concern ourselves; what is more important, however, is the extent to which chemists may be compelled to enter the trade union after affiliation. There have been plenty of instances where trade unionists have struck because certain of their colleagues did not belong to their union. Are we likely to find the same sort of thing with the B.A.C. in time to come? That anything of this sort should occur would seem to our uninstructed mind to be something of the last indignity that could happen to the chemical profession.

The Question at Issue

THE issue is important because it is an outstanding example of the merging of a professional body—if the Council's motion is approved—in the trade union movement. That some other professional bodies have become affiliated is beside the point. The issue might even become whether ultimately the B.A.C. will comprise only juniors and laboratory assistants, to whom the idea of uniform wages and

common action may be entirely appropriate, or whether it will continue to include senior chemists as well. The jury has already retired to consider its verdict; we shall wait the decision and its outcome with considerable interest, and no little sympathy. The B.A.C. has done very valuable work in the past. Long may it continue to do so.

Patent Medicines

ON the whole, the chemical industry proper is not directly concerned with the manufacture of " patent " medicines, which are more correctly described as "proprietary " medicines, since medicines cannot now be patented. Many fine chemicals, however, go into the concoction of these materials, and it is fitting, therefore, that the industry should have some notion of what is beng said and done around the subject. The Pharmaceutical Society keeps a watchful eye upon them, with the result that nowadays there are few if any really " quack " medicines in existence. It is the method of distribution, rather, which exercises the minds of reputable pharmacists to-day, and there is undoubtedly much that could be done to improve things in this direction. The case is put succinctly in a pamphlet, " Patent Medicines : An Indictment," by Mr. H. Linstead, M.P., secretary of the Pharmaceutical Society, which has just been published by *National News-Letter*, and which, we understand, is obtainable only from them, at the price of one shilling.

An Indictment and a Remedy

DEALING with both the past and the future, Mr. Linstead states his case plainly, ending with an indictment followed by suggestions on what should be done. The main objection to the present system is that the advertising of "patent" medicines makes the public disease-conscious and creates an atmosphere of fear. Testimonials of little value and exaggerated claims are rife; and, by implication, public confidence in a State medical service and in registered practitioners is undermined. In certain instances excessive prices are charged, and psuedo-scientific language is often used. We are reminded of the " patent medicine advertisement " for water, in a magazine competition, which described that universal panacea as " calcined protium." The main remedy suggested by Mr. Linstead is that the Minister of Health should accept responsibility for the oversight of proprietary medicines, and that a register of medicines should be compiled, those not complying with the regulations to be withdrawn from the register and their sale made illegal. This is just an outline of the detailed proposals made. We suggest that Government officials would be better employed in considering the terms of this much-needed reform than in altering the names of innocuous biscuits.

Wholesale Prices in July

THE most striking feature about the trend of wholesale prices in July was the very steep rise in non-ferrous metals, as measured by the Board of Trade index figures. The advance of 12.4 per cent. over the June figure is one of the biggest recorded among industrial materials for some time past, the current figure being 161.2 as against 143.4 in the previous month (1930=100). Six of the eight items in this group were affected, zinc rising by as much as 27½ per cent., English lead by 21½ per cent., and electrolytic copper, copper wire, and copper solid-drawn tubes by 16½, 15, and 9 per cent. respectively. Brass strip or sheet advanced by 14 per cent. Under the head of " chemicals and oils " the rise was 1.0 per cent., the chief contributory items being white lead paint (9 per cent.), soap (5½ per cent.), and copal varnish (slightly over 4 per cent.). Fertilisers recorded a fall of a little over 6 per cent., the final index figure for all chemicals being 147.6, compared with 146.1 in June. Iron and steel advanced by 0.6 per cent. from 205.2 to 206.4.

A Philosopher's Passing

WHILE these columns were being written, news came to hand of the passing of a man whose influence on the modern attitude to science and scientific education has been of the profoundest. H. G. Wells died on August 13 at the age of 79. Some journalistic play has been made with the date and with the number of his house—13 Hanover Terrace—but surely no man has had better fortune in his work, nor better deserved it. Whatever opinion one may hold of his philosophy, there is no question that Wells—B.Sc., London, with honours—did much to put the scientist right with the public. No great scientist himself—his mind was too volatile—he fully understood the scientific viewpoint, and his writings did good service in displaying the scientific worker in relation to ordinary life.

Nickel in War-Time Germany

Recovery from Low-Grade Ores : Production of Powder

by DAVID D. HOWAT, B.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E

ONE of the most important gains secured by Germany when Finland became its ally in war was the winning of almost the total output of nickel ore from the mine at Petsamo. This copper-nickel ore deposit in the far north of Finland represented practically the only source in the world from which Germany could obtain the relatively small but absolutely essential quantities of nickel required for war industries. Some useful light has been thrown on the nickel industry in Germany during the war by two recent reports.*

According to these reports, maximum production from the Petsamo mine was about 350,000 metric tons per year, the ore containing about 2¼ per cent. copper and 4½ per cent. nickel. The total output of ore from the Petsamo mine was to be treated in three separate smelters: the Petsamo smelter, with a capacity of 250,000 metric tons per year; the Nord-Deutsche Affinerie at Hamburg, with a capacity of about 60,000 tons per year; and the Hoboken smelter. The last, however, completely failed to reach the target figures.

At Petsamo, with a hydro-electric power station rated at 25,000 kW, the ore was smelted in electric arc furnaces to give a low-grade matte. Each furnace, rated at 10,000 kW, smelted about 550 tons of ore per day, the slag produced containing less than 0.2 per cent. nickel and less than 0.1 per cent. copper. The matte was concentrated in a horizontal converter taking charges of about 4 tons of liquid matte. High-grade matte obtained from the converter contained about 55 per cent. nickel, 25 per cent. copper, 8 per cent. sulphur, and the balance iron and slag, this matte comprising the main raw material supplied to the nickel powder plant of I.G. Farben at Oppau.

Oppau Powder Process

Production of nickel powder at the Oppau plant followed the main lines of the classic Mond process, the nickel being separated from the other constituents of the ore in the form of the volatile nickel carbonyl $Ni(CO)_4$. The salient points of difference in the procedure followed at Oppau as compared with nickel smelting at Copper Cliff in Canada and at Clydach in Wales appear to be:

(1) No attempt is made to effect any preliminary separation of the nickel and copper in the matte as is done at Copper Cliff by the "tops and bottoms" process, the charge being simply the finely crushed matte from the converters.

(2) The nickel-copper matte is treated as a sulphide, while at Copper Cliff and at Clydach the nickel sulphide is oxidised by a preliminary treatment either in D.L. sintering machines or in rotary calciners with revolving hearths.

(3) Volatilisation is carried out under a pressure of 200 atm. as compared with treatment at atmospheric pressure at Clydach. At Clydach, the residue from the preliminary treatment with carbon monoxide is subsequently subjected to a further volatilisation treatment under a pressure of 300 lb./sq. in.

Volatilisation Treatment

The volatilisers employed at Oppau are standard pressure vessels from the ammonia plant, each being approximately 500 mm. internal diameter, 8 m. long., with apertures 120 mm. diameter, top and bottom. They are constructed of creep-resisting steel containing 0.5 per cent. chromium, tungsten, and molybdenum, the inner surfaces being corrugated. The arrangement employed is to group four pressure vessels together to form a unit assembly, each assembly taking a charge of 20 tons of crushed matte. The reaction chambers are heated to a temperature about 250° C. Carbon monoxide gas, preheated by steam and electric heaters, is admitted to the vessels at a pressure of about 200 atm., the gas supply being obtained from the ammonia plant. The rate of circulation of the gas is about 30 cu.m. (measured at 200 atm.) per hour. The actual time occupied for the volatilisation treatment is three days, with one day for charging and one for discharging, thus enabling about six cycles to be effected per month. About 85 per cent. of the nickel is removed from the charge during this time.

The gases escaping from the top of the chambers contain the volatile nickel carbonyl together with various quantities of iron carbonyl as an impurity. After passing through copper gauze and flannel filters to extract the dust, the gases are cooled and passed through condensers to collect the liquid nickel carbonyl, the carbon monoxide being recirculated to the reaction chambers. The liquid nickel carbonyl after passing through a pressure-reducing trap is collected in storage tanks where it is maintained

* *CIOS* XXIV-12, I. G. Farben, Oppau Works, Ludwigshafen (H.M.S.O.; 1s. 6d.); *BIOS*. 263, I. G. Farben, Oppau, and Nord-Deutsche Affinerie, Hamburg (H.M.S.O.; 2s. 6d.).

under a pressure of 5 atm. of carbon monoxide. The liquid carbonyl is distilled to enable the nickel carbonyl (B.P. 43°C.) to be separated from the iron carbonyl (B.P. 103°C.). Fractionation is carried out under a pressure of about ½ atm. with a maximum temperature of 80°C.

From the distillation plant the liquid nickel carbonyl passes through a vaporising cylinder, the gas being then fed to the decomposers. These are cylindrical chambers maintained at a temperature of 220/240°C. and under a pressure of 200/400 mm. w.g. over atmospheric. The nickel carbonyl decomposes, forming nickel powder and liberating carbon monoxide gas which is recirculated. The German flow-sheet is shown in Fig. 1.

At Oppau three forms of nickel powder are produced. The standard powder, with an average particle-size of 4-8 μ, is used mainly for steel manufacture, drums of the powder being charged directly to the open hearth steel furnaces. A powder with a finer particle-size of approximately 2 μ with a packing density of 0.8 kg. per litre, is produced for the manufacture of accumulator plates. A special high-purity powder (carbon 0.02 per cent., iron 0.01 per cent., and sulphur 0.0005 per cent.) with an average particle-size of 4 μ is produced in small quantities.

The residue from the Oppau volatilisers, containing about 70 per cent. copper, 3-4 per cent. nickel, with the balance mainly sulphur, but carrying appreciable quantities of the precious metals (gold 5 g./ton, and platinum plus palladium 15 g./ton) is sent to the Nord-Deutsche Affinerie at Hamburg.

Smelting and Refining

Some useful information is given on the operations carried out at N.D.A., Hamburg, on the treatment of the nickel copper ore from Petsamo and on the recovery of the copper and the precious metals from the residues from Oppau.

Smelting of Petsamo ore, which began late in 1941, comprises sintering on D.L. machines, blast-furnace smelting of sinter and crude ore to produce matte, and the treatment of this low-grade matte in converters to give high-grade matte suitable for the nickel powder plant at Oppau. Rough crushed ore as received from Petsamo has the following approximate analysis:

	Per cent.
H_2O (moisture)	2.42
Cu	2.42
Ni	4.42
Al_2O_3	3.3
Fe	26.8
SiO_2	20.0
CaO	1.3
S	13.6
MgO	24.9

After crushing to 8 mm. size, about two-thirds of the ore, with blast-furnace flue dust and silica sand as flux, is treated on a D.L. sintering machine, 1.5 by 12 metres. About 60 tons of sinter are produced per shift from this D.L. machine, the average composition of the product being:

	Per cent.
Cu	1.59
Ni	2.78
Fe	22.59
SiO_2	41.25
CaO	1.55
MgO	9.75
S	2.25

Smelting for low-grade matte production is carried out in a blast furnace, measuring 1.10 by 6.40 m. at the tuyere zone and with a capacity of about 60 tons of ore per day. Charge to the blast furnace comprises crushed Petsamo ore, to the extent of about one-third of the total received by the smelter, sinter from the D.L. machines, converter slag, converter shells, and lime and silica sand as fluxes. A typical charge made to the blast furnace is as under; for this weight of charge 511 kg. of coke, equal to 17 per cent. of the charge weight, would be added as a separate layer.

	kg.	*Per cent.*
Petsamo ore direct	777	25.89
Petsamo ore sintered	1160	38.60
Converter slag	322	10.73
Returned matte (B.F. and converter)	52	1.74
Rejects, converter shells, etc.	185	6.13
Limestone	254	8.46
Silica sand	183	6.11
Return slag	67	2.28
Total	3000	100.00

The usual practice with blast-furnace smelting for matte production is followed, the charge running continuously from the furnace into an external settler. Slag overflows continuously from the settler while charges of matte are tapped from the bottom at intervals for treatment in the converter. The low-grade matte produced contains 22 per cent. nickel, 15 per cent. copper, 37 per cent. iron, and the balance sulphur, while the slag carries 0.28 per cent. nickel, and 0.20 per cent. copper. The slag composition is controlled to give a magnesium/calcium ratio not exceeding 2/1, which ensures a reasonably fluid slag giving little trouble in the settler.

Horizontal Converters

Converters employed are of the usual horizontal type, 2.5 m. dia., some being 3.3 m. long, and others 4.6 m. long. Air at 15 lb./sq. in. is supplied through 18 tuyeres in each converter. Low-grade matte when blown in the converter yields about 2½ tons

of slag for each ton of high-grade matte produced, the usual finished charge being about 6 tons of high-grade matte. Blowing is continued after the removal of the iron until the sulphur content has dropped to about one-quarter of the copper content, the usual blowing time required being 9-9½ hours. High-grade matte produced contained 37 per cent. nickel, and 50 per cent. copper, and the balance mainly sulphur, with less than 0.5 per cent. of iron and cobalt. The converter slag, returned to the blast furnace for further treatment, contains about 4.2 per cent. nickel, and 2.6 per cent. copper. The high-grade matte is cast into slabs, which were subsequently broken up before being shipped to Oppau.

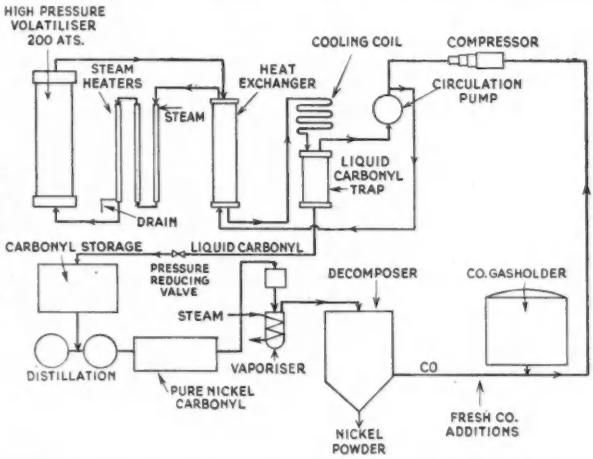


Fig. 1. Diagrammatic flow-sheet illustrating the manufacture of nickel powder at the I.G. Farben plant, Oppau, Germany.
(*B.I.O.S. Final Report No. 263, Item No. 21*).

Treatment of Residues

A further section of the reports is concerned with the treatment of the copper-nickel residues received back from Oppau after the extraction of the nickel in the form of the carbonyl. As these residues contain a high percentage of copper and only small quantities of nickel they are treated in the usual manner for copper concentrates. That system of treatment comprises smelting in reverberatory furnaces to produce high-grade copper matte, blowing the matte to "blister copper" in the converter, and preliminary fire-refining of the blister copper, which is then cast into anodes for electrolysis. During the electrolysis of the copper anodes the precious metals accumulate in the "anode mud," while the small percentages of nickel dissolve in the electrolyte. The anode mud is treated for the extraction of the precious metals.

To recover the nickel in the electrolyte, quantities of the solution are withdrawn from the end tanks of the banks of cells and the copper removed by stripping in separate cells fitted with lead anodes. The solution, from which the copper has been stripped, is then treated in batches by heating to 95° C. in the presence of metallic copper, the greater part of the arsenic and antimony being precipitated as copper arsenide and antimonide. The filtered solution is then evaporated and the greater part of the nickel crystallised out as anhydrous nickel sulphate, the sulphate being further purified by recrystallisation. To recover the nickel in the metallic form the sulphate is converted to the carbonate by precipitation with soda ash. Quantities of the nickel carbonate are then added to the electrolyte in a separate tank for the production of electrolytic nickel. In this tank the electrolyte is maintained at a nickel concentration of 90 gm./l., with a free sulphuric acid content of 2 to 3 gm./l. Lead anodes are employed while the nickel is deposited on aluminium cathodes from which the deposit is stripped at intervals, the current density employed being 175 amps./sq. metre.

Manufacture of Iron Powder

The raw material for the manufacture of iron powder is *Eisenstein*, containing approximately 92 per cent. iron and 8 per cent. sulphur. This alloy is prepared by melting together steel scrap and iron pyrites in a rotary furnace, the melted charge being poured into flat slabs.

The *Eisenstein* is broken and crushed to a maximum particle-size of about 10 mm. and then charged to the reaction cylinders, which are practically duplicates of the nickel-powder reaction cylinders. Carbon

monoxide gas at a pressure of 70 to 200 atm. is fed to the cylinders which are maintained at a temperature of 200°-220°C. for about four days. At the end of this period about 70 per cent. of the iron in the *Eisenstein* is converted to iron carbonyl, the solid residue being returned to the melting furnace. From the reaction cylinders the gases pass to coolers and condensers in which the liquid carbonyl is separated.

Liquid iron carbonyl flows into vaporising cylinders heated by steam coils, the vapour produced passing into the decomposing cylinders. The decomposers, 3 m. high by 1 m. dia., are operated under normal pressure and maintained at a temperature of 240°C. The iron powder formed by the decomposition of the carbonyl contains 0.6 to 1.2 per cent. carbon. Although a certain small percentage of dry ammonia gas is introduced into the decomposers to reduce the tendency of the carbon monoxide to decompose, through the catalytic effect of the finely-divided iron, a certain degree of decomposition is inevitable, the carbon so produced being immediately absorbed by the iron powder. The iron powder collects in a chamber at the base of the decomposer from which it is removed by means of a collapsible rubber sleeve.

To reduce the carbon content and to eliminate traces of carbon monoxide gas and oxides, the iron powder is heated in reduction furnaces at a temperature of 400°-500°C., an atmosphere of hydrogen being maintained. These furnaces (*Gluhofen*) are horizontal steel chambers, 4 m. long, 1.5 m. wide, and 250 mm. deep, heated by electric resistance coils. Gas content of the powder after treatment is claimed to be not more than 0.1 per cent. of hydrogen and nitrogen. Production of iron powder during the war was at the rate of approximately 20 tons per week. The main uses of the product are for electromagnetic purposes, principally the manufacture of the well-known Puppin cores, and for accumulator plates.

Control of Particle-Size

The average particle-size and the packing density of the metal powders produced by these methods are determined largely by the conditions in the decomposers. A high rate of production, corresponding to a fast throughput of gas, and a high operating temperature, accelerate the decomposition of the carbonyls, giving a light powder, with small particle-size. Alternatively a slow rate of production, corresponding to a slow gas flow, gives a heavy powder with larger particle-size. The same effect is obtained with a higher decomposer chamber, the greater height giving a longer distance of travel for the particle in falling to the bottom, and leading to the formation of larger particles by the decomposition of more metal during the period of fall. In the case of nickel-powder manufacture the extreme liimits of rates of production are from 300 kg. to 1500 kg. of powder per unit per day.

The main types of iron powder produced were: Grade E, with about 0.6 per cent. carbon and 0.1 per cent. nitrogen; Grade C, made by decarburisation of Grade E, containing 0.04 per cent. carbon; and Grade H, produced by air elutriation of Grade E, composed of the finest particles, averaging 1 to 2 μ in diameter.

Nickel Compounds

Research Fellowship Sponsored

IN connection with the German work on nickel described above, it is interesting to record some of the investigations which are being covered by a multiple research fellowship sponsored by the International Nickel Co. at the Mellon Institute, Pittsburgh, Pennsylvania, as noted in the report of the Director of the Institute (Dr. E. R. Weidlein) for 1945-46. New nickel compounds and catalysts of special promise are being prepared and are under study in co-operation with industrial and government laboratories.

Nickel arsenate and nickel ethylene bisdithiocarbamate are possible pesticides for agricultural use; and nickel arsenate, naphthenate, and sulphate are giving interesting results in long-term wood-preservation tests. Exhibiting suggestive properties are nickel dibutyldithiocarbamate, oleate, and stearate as lubricant additives; substitute carbonyls and β-diketone derivatives as motor fuel additives; and nickel diethyldithiocarbamate as an anti-oxidant and accelerator for rubber. The familiar red dimethylglyoxime nickel derivative, as well as the maroon α-furyldioxime compound, and several other less familiar organic complexes are being investigated as pigments; and nickel chromate as a corrosion-inhibiting pigment.

Catalysts are being made from organic compounds of nickel such as the formate and oxalate, from new alloys of the Raney type, and by the precipitation of a great variety of compounds ranging from pure hydrated nickel oxide to complex mixtures such as nickel tungstate-sulphide. Efforts are being exerted to develop catalysts with more highly reproducible properties, active over wider temperature ranges, and more resistant to poisoning. Collaborative projects in catalytic hydrogenation, dehydrogenation, and desulphurisation, especially in petroleum chemistry and the synthesis of liquid fuels, are leading to valuable information on nickel catalysts for industrial use.

The Drug Called BAL

Treatment of Arsenical and Other Heavy-Metal Poisoning

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

IN the handling of all toxic materials prevention is better than cure, and this is especially so when the cure is non-existent or of dubious efficacy. The situation becomes extremely serious when preventive measures are uncertain in efficiency from one cause or another and the cure is non-existent.

Until recently there existed no cure for arsenical poisoning, at least, in the chronic stage. Antidotes in the acute stage were effective in a degree depending greatly upon circumstances. Thus it had become imperative that industrial hazards from arsenic intoxication such as might be met with in the manufacture of pigments, glass, weed-killers, insecticides and medicinal chemicals should be subject to control by positive and reliable preventive measure. Personnel who contracted arsenic poisoning despite all precautions were doomed to a spell of pretty poor health in the best circumstances.

Types of Arsenic Poisoning

However, the risks of arsenic poisoning are equally great in the world outside these industries concerned with the handling of arsenical material. For example, in the past it has been possible to digest toxic amounts of arsenic with contaminated foodstuffs. This hazard has been brought almost completely under control in this country since the Royal Commission on Arsenical Poisoning recommended in 1903 that no substance used in the manufacture of food or drink should contain more than 1.4 parts per million of arsenic as As_2O_3. By contrast criminal poisoning by arsenic is still far from being under control and it remains one of the commonest methods of such poisoning, the incidence differing in various countries mainly with accessibility of material. In this last category may be included, by a selection of moral emphasis, the use of arsenical chemical warfare agents such as lewisite, against the effects of which there was no known cure up to the outbreak of the late war.

An unusual set of circumstances arises in the administration of arsenical drugs for therapeutic purposes. Here the ingestion is deliberate, and the risk of some degree of toxic action especially during prolonged treatment fairly certain. It is not surprising if some attention has been directed towards detoxification in this class of problem rather than in those mentioned earlier, principally because the drug is administered under direct medical supervision.

The use of arsenic derivatives in medicine has become of great importance in the treatment of disease and, indeed, the era of chemotherapy was heralded by Ehrlich's introduction of the trypanosomicidal arsenicals in 1909, and particularly arsphenamine ("Salvarsan" or "606"), for the treatment of syphilis and other trypanosome infections. Since that date a number of aliphatic and aromatic arsenic derivatives have been introduced to combat these parasites; their advantage is that, on account of the slow cleavage of arsenic as a result of the metabolism of such compounds, the toxic effect of these compounds is milder and more delayed than when the arsenic is administered in an ionic form. It is because of the relatively high toxicity of arsenic in the ionic form that the manufacture of these arsenicals is subject to the rigid requirements of the Therapeutic Substances Act. Thus the compounds do not become available until it has been ascertained that they are free of the toxic ionisable form of arsenic with which they might be contaminated as a consequence of errors of manufacture.

Even when free of ionisable arsenic the fact remains that these drugs are toxic to the host as well as to the parasites, and what is sought in developing them is, *inter alia*, as large a margin as possible between the maximum tolerated dose and the minimum curative dose. The ratio of these quantities is Ehrlich's "Chemotherapeutic Index." Of course, even where this margin is wide, statistical consideration as well as individual idiosyncrasies are involved, so that the need for detoxification may arise during or at the end of treatment.

Toxic manifestations may take a variety of forms according to circumstances, resulting in damage to the capillary endothelium, rigor, headache, cramp, exfoliative dermatitis, etc., and the liver is particularly likely to be damaged.

Attack on Systemic Poisoning

Until recently no satisfactory antidote in systemic poisoning has been available. Where, as in therapy with arsenical chemotherapeutic agents, the metal has become fixed in the tissues, detoxification has been attempted by injection of sodium thiosulphate, but the results are uncertain and the treatment is somewhat discredited.

It need hardly be said that the possible use of arsenical vesicants such as lewisite (chlorvinyldichlorarsine) has raised the question of detoxification in human systemic arsenic poisoning in an even more urgent manner. The attack on the problem began

in the mid-thirties when Peters at Oxford recognised that a precise knowledge of the mechanism of arsenic intoxication was a prerequisite. Coke had observed in 1931 that with thiol (—SH) groups arsenic formed thioarsenites of the type:

$$R.As(SR')_2$$

which had the property of dissociating in alkaline solution. He went on to suggest that by some similar mechanism arsenic poisoning might be reversible *in vivo*. It was known, of course, that arsenic reacted readily with the thiol groups which are universally distributed in living tissues, particularly in the form of glutathione, which is intimately concerned with their anaerobic respiratory processes.

Probable Action of Vesicants

In 1936 Peters suggested that these vesicants inhibited the pyruvate oxidase enzyme system, as iodoacetic acid, dichlordiethylsulphone, and arsenite were known to do. Pyruvic acid is formed as a product of intermediate carbohydrate metabolism and is cleared from the tissues by a number of means, the most important, perhaps, being the Krebs citric acid cycle. In this cycle the pyruvic acid first reacts with oxaloacetic acid and then, passing through a sequence of nine reacting aliphatic acids, it is first built up to a 6-carbon chain acid, and then degraded to carbon dioxide and regenerated oxaloacetic acid with which further pyruvic acid reacts. At each degradative step from the 6-carbon acid a small amount of energy is released for coupled synthetic reactions in the tissues which are, at the same time, protected from sudden heat changes.

Aneurin (thiamine; vitamin B_1) in the form of its diphosphate, co-carboxylase, is implicated in the oxidative removal of pyruvic acid by means of the Krebs citric acid cycle, and any inhibition of the action of co-carboxylase leads to the accumulation of pyruvic acid in the blood, a lesion which is characteristic of vitamin-B_1 deficiency. Since this system is inhibited by arsenic it was possible to use the accumulation of pyruvic acid as a yardstick of arsenic intoxication and its clearance as a yardstick of detoxification, in experimental work.

Cameron, in 1942, reported experimental work in which he labelled serum albumin, by allowing it to react with a diazonium hydroxide of the trypan blue type, and found that systemic lewisite poisoning involved loss of blood plasma at sites which were widely spread throughout the body. It became apparent, therefore, that a detoxifying agent was required which, in addition to being sufficiently non-toxic itself, was capable of reaching the whole vascular system, which would prevent the arsenic that might be present in the blood stream from penetrating into tissues, which would remove arsenic from cells already penetrated, and which would form a readily excretable complex with the arsenic.

The knowledge that arsenic reacted readily with thiol groups led to an examination of a series of monothiols as detoxifying agents, but without success. Stock and Thompson at Oxford made a detailed study of keratein (the reduced form of keratin) with arsenic and found that when tervalent arsenic combined with a pair of thiol groups in one molecule a stable ring system was formed. A dithiol compound was now sought which, in addition to being non-toxic itself, would contain sufficient polar groups to impede its own diffusion into cells, since it was thought that such lack of diffusibility would promote the withdrawal of dissociated arsenic from the cells into the blood stream and the subsequent renal secretion. In short, the arsenic fixed in the tissues would partition itself between the tissues and the detoxifying agent in the blood-stream in such a way that the distribution would be in favour of the latter.

A Suitable Dithiol

A search of a large number of dithiols led to the choice, as the most satisfactory agent, of 2:3-dimercapto propanol ($CH_2SH.CHSH.CH_2OH$), or dithioglycerol—called "British Anti-Lewisite," or BAL for short—which reacts with lewisite thus:

$$\begin{array}{l} H_2C{-}SH \\ HC{-}SH \\ H_2C{-}OH \end{array} + Cl_2As.CH:CHCl \longrightarrow \begin{array}{l} H_2C{-}S \\ HC{-}S \\ H_2C{-}OH \end{array} \!\!\diagdown\!\!\diagup As.CH:CHCl$$

BAL, in accordance with postulate, was found to diffuse into cells slowly and so was distributed mainly in blood and intracellular fluids, and the complex with lewisite was found to be excreted rapidly in the urine. *In vivo*, BAL was found to stop local damage to tissues by lewisite and to check signs of systemic poisoning. Its clinical use in arsenic poisoning has been developed in both Britain and the U.S.A. In the latter country it was found that, applied by inunction, it was able to penetrate the skin, protect the test enzyme, and prevent the accumulation of pyruvic acid; moreover any fixation of arsenic in the cells which had occurred was reversed. In 1943 arsenical dermatitis and encephalitis was successfully treated in the U.S. by means of BAL by inunction, but this method was later superseded by intramuscular injection of BAL in 10 per cent. benzyl benzoate in pea-nut oil. Further, considerable evidence is forthcoming from the U.S. that BAL is effective in the treatment of poisoning by other metals such as mercury (also used in chemotherapy) zinc, and cadmium, so

that the range of usefulness of the drug appears to be on a wider basis than could have been hoped for.

"BAL-intrav." has been developed in Britain for intravenous injection and this is a solution of the O-glucoside of the dithioglycerol.

McCance and Widdowson more recently have reported that BAL is essentially non-toxic to man and has no allergic properties.

Thus, from the exigencies of war has come a therapeutic agent which combats arsenic and probably heavy-metal poisoning in general in all the ways in which it may arise, whether industrial, therapeutic, or plainly criminal, and with potentialities yet to be fully explored. Not the least interesting feature of the development has been the rational biochemical approach to the central problem, and in this the British workers have acquitted themselves with distinction.

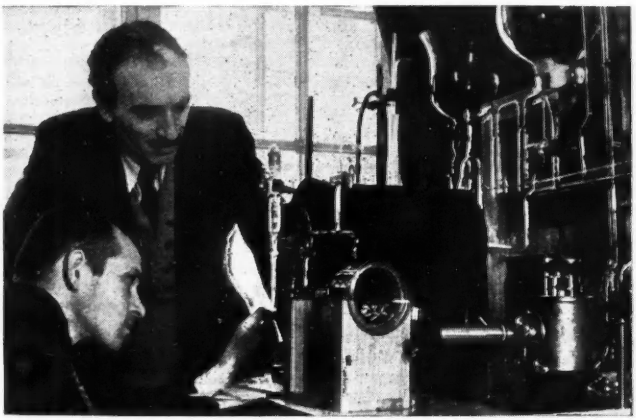
Chemical Kinetics

Some Aspects of Russian Physico-Chemical Science

by PROFESSOR B. BERKENHEIM

THE Academy of Sciences Institute of Chemical Physics, which was founded by Academician N. N. Semenov in Leningrad in 1931 and later transferred to Moscow, where it is still working, is one of the youngest but nevertheless one of the leading scientific institutions of the Soviet Union. Its scientists study some of the most important problems in modern chemistry—the kinetics of chemical processes. This is a field in which many famous Russian chemists have been interested—Bach, Menshutkin, Titov, Shilov, and others who are quite well known.

In the 20th century chemical kinetics has become very important both in theoretical and industrial chemistry. The leading figure in the study of this problem in the U.S.S.R. is Academician Nikolai Semenov, whose development of the chain theory of chemical reactions is well known. His theoretical conclusions have been proved by the experimentation of his pupils. Semenov began intensive development of the chain theory in 1928 and his book, "Chain Reactions," published in Russian and English in 1935, is, according to Professor Hinshelwood, an everyday manual for every scientist engaged in chemical physics.



Academician Nikolai Semenov (standing), with his closest colleague, Nikolai Chirkov, studying the speed of the oxidisation of carbo-hydrates in one of the laboratories of the Institute of Chemical Physics, Moscow.

The chain of chemical reactions gets its name from the fact that a primary reaction may give rise to a series (chain) of secondary reactions. The process may be imagined by assuming that in the course of the process of reaction a number of intermediary, unstable products are formed. These inter-

mediary products, entering into a reaction with the molecules of the original substance, form the molecules of the final product of the reaction, and again produce an intermediary product capable of further transformation.

Semenov also developed the theory of what he called the "branching of chain reactions," the breaking of the chain on the walls of the vessel in which the reaction is taking place and in its volume (this simultaneously with Hinshelwood), heat explosion and a number of other fundamental problems in the theory of the course of chemical processes.

Intermediary Reaction Products

During recent years the greatest attention has been paid to the discovery and identification of intermediary active substances which give rise to the chain process. Professor Kondratiev, Corresponding Member of the Academy of Sciences, made a spectroscopic analysis of intermediary products of the combustion of hydrogen and discovered the formation in the course of the process of a considerable quantity of the univalent radical hydroxyl (OH). Also with the aid of the spectroscope, Emanuel showed the presence of sulphur monoxide (SO) as an intermediary product during the oxidation of hydrogen sulphide. Newman, who used the polaroscope method to investigate the oxidation of the hydrocarbons, showed that active intermediary products of the oxidation—peroxides and aldehydes—are accumulated in the course of the process in accordance with the laws of the chain theory. Neuman's work is of interest for the study of the process of the combustion of gas mixtures in motors. This aspect of the work at the institute is under the direction of Professor Sokolik, and has already produced practical results.

Academician Semenov and his fellow-workers and students are likewise noted for their work on the theory of combustion. Of special interest is the work of Professor Zeldovich, who produced a regular theory of the slow spread of flames; he developed, too, a theory of the limits of ignition and the limits of detonation, and improved on the theory of detonation waves.

The transition from slow combustion to detonation is another subject of theoretical interest and practical importance. This problem was studied theoretically by Professor Zeldovich, and experimentally by Shelkin and Belayev. Shelkin represents the mechanism of the transition from combusion to detonation as the result of turbulescence in the area of the combustion. He proved it experimentally by providing artificial conditions for increased turbulescence by introducing artificial obstructions in the tube in which the flame was burning—using a wire spiral, for example, Belayev analysed the same question in its application to secondary explosive substances. Professor Hariton heads the Institute's work on the study of the combustion and detonation of condensed explosives. The results of his work have found application in a number of practical fields.

Theory of Catalysis

Another important branch of the work of the Institute of Chemical Physics is connected with the name of Professor Roginsky, Corresponding Member of the Academy of Sciences, who worked in the Institute up to 1941, when he transferred his work to another institute—the Institute of Colloido-Electrochemistry of the Academy of Sciences. The professor works in the field of catalysis and has developed a theory connecting catalytic action with the extent of the deviation from equilibrium during the preparation of the catalysts. Roginsky and his students have done important work on the study of gaseous promoters whose action is explained by Roginsky as being due to the chemical homogeneity which gives rise to the active qualities of the surface of metals and other catalysts. He has also studied the mechanism and kinetics of catalytic reactions (especially carbon, hydrogen, and nitrogen oxides), and other problems. Roginsky and his students have studied the application of the use of "marked atoms" to the study of the mechanism and kinetics of catalytic reactions.

The research work done by Academician Semenov and his school is acclaimed by all scientists working in the field of chemical kinetics and the theory of combustion.

MINERALS IN GUATEMALA

According to a report on the utilisation of Mineral Resources of the Republic of Guatemala, prepared under the auspices of the Inter-American Development Commission at the request of the country's Government, Guatemala offers prospects for the production of a number of minerals which are gradually becoming exhausted in the United States and which are, generally speaking, in not too plentiful supply in the Western Hemisphere. Gold, silver, and chromite are at present being mined in the Republic, but deposits of lead, zinc, and copper could well be developed. It is also possible that iron and petroleum may be found in workable deposits. Iron-ore occurrences in the Department of Chiquimula are being examined by representatives of a large steel company in order to determine their extent. Among non-metallic minerals which may be further developed, mica and quartz crystals are mentioned, and commercial opportunities may also be offered by lime, clay, feldspar, and silica.

Sealing a Rotating Shaft

Metal Bellows Construction

by ROLT HAMMOND, A.C.G.I., A.M.Inst.C.E.

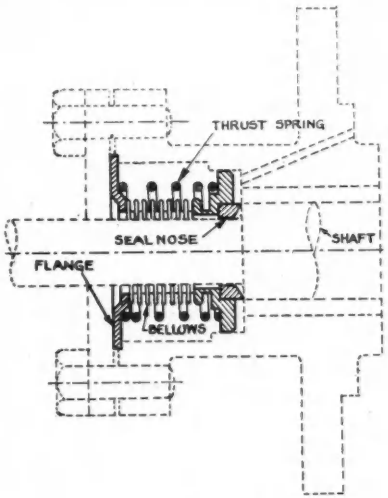
THE problem of providing an efficient seal for a rotating shaft projecting from a closed system is one with which engineers are constantly confronted. The bellows shaft seal illustrated is an excellent solution and has been well tried in service; it is particularly suitable for the shaft seal assembly in a refrigeration compressor, but has a wide field of application throughout industry for air compressors, pumps, gear boxes, paper machinery, and chemical plant.

The assembly comprises bellows, flange, seal nose of special metal, and thrust spring; design is critical, practically every component demanding detailed study. For example, the relation between the effective area of the bellows and the diameter of the seal nose bearing ring is an important factor. The seal nose must have adequate mass and rigidity enabling it to withstand distortion during the final diamond facing operation and later at the comparatively high temperatures encountered in service. It is generally made of a high-lead bronze, but selection of the most suitable alloy will depend upon such factors as speed of shaft rotation, hardness of the bearing shoulder on the shaft, character of the mechanical finish, and nature of material against which the seal is being provided.

Design of the thrust spring has given as much difficulty as any other item; it must exert correct thrust at its working length, in a direction parallel to and concentric with the axis. It is therefore essential that each spring should be tested individually under load assembly in the seal unit. Under normal conditions, the pressure required to give the necessary sealing varies from 120 to 160 lb./sq. in.; its precise value is determined by the pressure required to obtain a satisfactory seal for leaded bronze seal rings.

It is essential that the spring should be accurately squared at the ends in its working position, thus ensuring uniform bearing pressure and avoiding deterioration of the seal face. It must also be a highly "rated" spring in order to avoid assembly difficulties, such as stretching of the bellows unit well beyond its free length, thereby increasing the difficulty of flange assembly. Where the spring may be exposed to attack by corrosive substances, it can be treated with nickel or cadmium plate. Another design feature is that the outside diameter of the seal ring of the bellows unit is made equal to the mean diameter of the bellows or slightly greater; the effect of the pressure against which the seal operates is therefore balanced out, or tends slightly to increase the pressure at the sealing face.

The Hydroflex metal bellows used in this device is made by the Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex, who employ a special hydraulic



Hydroflex bellows shaft seal

process for forming the corrugations. This method of manufacture involves the unrestricted flow of the metal of a thin walled tube under considerable hydraulic pressure in a collapsible die; the metal flows transversely between the die plates as the tube collapses longitudinally, thereby forming the bellows in one continuous operation. The outstanding advantage of this process, as compared with spinning or rolling operations, is that the bellows will be destroyed under high internal pressure during manufacture, should an imperfection or flaw develop in the metal.

The numerous chemical and other processes to which automatic control can be applied are described in "Automatic Control Schemes," published by Negretti and Zambra, Ltd., 122 Regent Street, London, W.1. The booklet is profusely illustrated with clear drawings.

Lactic Acid for the Plastics Industry

Methods of Purification

IN a discussion of the various grades of lactic acid, the *Revue des Produits Chimiques* (1946, No. 1106, p. 95) pays particular attention to the quality demanded in the manufacture of transparent colourless plastics. The specifications required for this material are extremely rigid, *e.g.*, the acidity must be superior to 50 per cent.; chlorides, calculated as chlorine, less than 5 parts per million sulphates, calculated as SO_4, less than 50 p.pm.; ash, less than 0.05 per cent.; and only traces of iron are acceptable, as this metal reacts with phenols to give coloured compounds. The presence of other metallic salts should also be avoided, as they result in insoluble compounds producing an opalescent effect.

Several processes have been recommended for the preparation of lactic acid of the required grade. A well-known method is that of purification by means of calcium lactate, a process commonly employed in the preparation of edible lactic acid, refining being effected with the aid of carbon black. Another procedure is to convert the calcium lactate into zinc lactate by the addition of a solution of carbonate or sulphate of zinc, and, after filtration, crystallising out the zinc lactate solution. The crystalline material is separated by centrifuging and dissolved in water; the zinc is then precipitated with sulphuretted hydrogen, while the solution is decolorised by means of animal black, filtered, and evaporated *in vacuo*. Advantage is taken of the fact that zinc lactate is the most easily crystallised of all the lactates.

Yet another method proceeds by the oxidation of the organic impurities contained in the acid. Lactate solutions and technical acid are exposed to the action of weak oxidisers, such as the hypochlorites of calcium or sodium, hydrogen peroxide, potassium chromate or permanganate, nitric acid, chlorine, or ozone.

Attempts to separate lactic acid by fractional distillation have not so far proved successful; and ordinary distillation is not commercially practicable, as it has to be carried out at a very high temperature and at reduced pressure. Similarly, solvent extraction by isopropyl ether is inadvisable, because of the highly inflammable character of the solvent.

Recently considerable attention has been devoted by the U.S. Department of Agriculture to another long-established method: purification by means of lactic esters. Broadly, the process consists of preparing organic lactates, *e.g.*, methyl, ethyl, propyl, or isopropyl lactate, and saponifying by means of steam or hot water, at ordinary pressures. The residue is then concentrated *in vacuo* to obtain a purified lactic acid. Details of the method most recently recommended (Filachione and Fisher, *Ind. Eng. Chem.*, 1946, *38*, 228) are as follows: methyl alcohol vapour is passed into an aqueous solution of lactic acid, and the vapour escaping from this solution is condensed. The condensate is found to consist of a mixture of ethyl alcohol, water, and methyl lactate. By distillation the methyl lactate can be separated out, and purified lactic acid obtained after hydrolysis. Other organic esters can, of course, be prepared, and catalysts, such as concentrated sulphuric acid, may be used to accelerate the etherification of the acid by the methyl alcohol.

New Control Orders

Iron and Steel Prices

THE control of Iron and Steel (No. 52) Order, 1946 (S. R. & O. 1946, No. 1359), and the Control of Bolts, Nuts, etc. (No. 12) Order, 1946 (S. R. & O. 1946, No. 1358), which came into operation on August 14, provide for higher maximum prices necessitated by increases in railway rates, coke prices, wages, etc. The maximum prices of the main qualities of pig iron are increased by from 4s. 6d. to 6s. 6d. per ton, and of heavy steel by 5s. per ton. Prices of more finished products have been, where necessary, increased by relative amounts. The orders also free wrought iron in any form and cemented carbide hard metal tool tips from control.

French Morocco

Research Developments

FROM Morocco it is reported that an Iron and Steel Research Institute is to be formed with a capital of 10,000,000 francs to undertake the treatment of local iron, and a Lead Research Institute will be formed with an initial capital of 100,000,000 francs to exploit lead resources. Construction of a new foundry at Zellidea will be completed within two years. Another research institute is to be formed to investigate the possibility of creating a chemical industry in Morocco. In order to finance these developments, a preliminary government loan of 5,000,000 francs is to be floated immediately.

SAFETY FIRST

Amenity as a Feature of Chemical Works—II

by JOHN CREEVEY

IF any degree of perfection is to be reached in this matter of amenity at chemical works, adequate attention must be given to what may be described as "personal service rooms." This term is essentially an American one, and the fullness of its meaning is often unknown to works in England. I do not mean to infer that chemical works in England are generally below the American standard of attention devoted to the personal care of the individual worker, for there are works here which can set a very high standard in this connection. Nevertheless, a large number of chemical works might be pointed out as outstanding examples where the worker is regarded simply as a person with certain duties to perform for so many hours per day, and otherwise is little more than a number on the works' pay-roll with National Health and Unemployment Insurance cards, National Identity card, and the like.

"Personal Service"

Some acceptable recommendations regarding personal service rooms, so far as they reflect American practice, have been set down in the *Handbook of Industrial Safety Standards* published by the National Conservation Bureau, New York, in 1942. All such rooms should be mechanically ventilated, and all exhaust ducts from them should discharge to the outside air.

Dressing rooms should be provided wherever the work performed involves excessive exposure to dust, dirt, heat, fumes, vapour, or moisture. For each individual employee whose clothes are exposed to contamination by material which is either poisonous, infectious, or irritating, there should be two lockers provided, one for working clothes, the other for the clothes which the employee wears when reaching and leaving work. Where processes are such that the working clothes become wet or require washing in the interval between shifts, they should be cared for so regularly that there is always a clean and dry set ready for use at the start of each shift, with a spare set in reserve to meet unforeseen emergencies. Dressing rooms should be provided with an adequate number of clothes hooks, boot rails, and stools or other seating accommodation.

For women employees there should be a retiring room as well as dressing rooms, if ten or more women are employed; even with a smaller number of women employees equivalent accommodation should be provided by a screened-off part of the dressing room, which is adequately lighted and ventilated by outside air. The minimum floor space required for a separate retiring room for ten women should be 60 sq. ft., increasing by 2 or 3 sq. ft. for each additional woman employed. One couch of approved hospital pattern should be provided in every retiring room.

Toilet facilities in general should be readily accessible to employees, and never more than one floor above or below the regular place of work. Certain standards of accommodation have been set down in regulations made under the Factory Acts, which should be consulted. Concerning American practice, *at least* two wash-basins with adequate water supply are considered to be the minimum for any number of persons up to ten, the accommodation being increased by one wash-basin for each additional ten persons up to 100, and thereafter one wash-basin for every 15 persons. Where there is likelihood of skin contamination by poisonous, infectious, or irritating material, the wash-basin accommodation should be doubled, *i.e.*, there should be one wash-basin for every five persons. Where washing facilities in the form of long sinks with individual taps are provided in place of separate wash-basins, two feet of sink should be considered equivalent to one wash-basin. Where the long sink is installed, there must also be at least two individual wash-basins, the number rising proportionately with the capacity provided for by the sink.

Water Supply

In all cases both hot and cold water should be provided; in the absence of hot water, possibly with small accommodation for washing, there must be facilities for obtaining hot water by aid of kettle and gas-ring, because cold water alone is inadequate where skin contamination is likely to exist. The likelihood of skin contamination also demands the provision of one shower bath, with ample supply of water, for every 15 persons. If hot water is supplied to this shower bath as well as cold water, means must be installed to control the upper limit of temperature as by a hot-and-cold water mixing valve.

Personal cleanliness is fostered by a general appearance of cleanliness through-

out the works. All machinery, stairways, corners, and similar places where routine cleaning might be neglected, may advantageously be given a coat of light grey paint; this paint is serviceable and will readily reveal any tendency to inadequate cleaning. Waste materials should never be allowed to accumulate, and for the prevention of this it is wise that the foreman of each section of the works should be made responsible for cleanliness in his particular province, with due authority to call and supervise the cleaning personnel. Oil, grease, or other products which have been spilt must be wiped up immediately, so far as existing conditions allow immediate attention. General cleanliness is promoted by "keeping clean," rather than "making clean at intervals."

Good Housekeeping

At every large works, each plant or section of the works should have its own Safety and Good Housekeeping Committee, composed of employees working in that section. Members of such a committee, by rota, should make frequent and unannounced inspections, and their suggestions and criticism should be brought forward for consideration. The highest standard of works cleanliness is reached only in this way, namely, by the proper co-operation of personnel. Cleanliness directed solely by the management of the works is rarely as effective as it might be, but this does not mean that the management can entirely wash its hands of all interest in this aspect of works control. To be familiar with the situation a man must have practical experience of working conditions. Nevertheless, at least one member of the works executive should be responsible for co-ordinating the work of the sectional Safety and Good Housekeeping Committees, and for imposing strict observance of general safety and cleanliness upon employees who disregard this or who are reluctant to take their due share in maintaining such conditions.

The use of shower facilities should be made compulsory where the nature of the work might predispose a man to some industrial skin lesion in the absence of washing thoroughly from head to foot. Wooden sandals or similar protective footwear should be provided for walking from dressing rooms to showers. At some American works, notably those of the American Cyanamid Co., employees attending the showers are requested to walk through a chlorine pool in going to and from the showers; these pools are scrubbed and refilled as soon as each shift has passed through the showers.

In every works where there is likely to be exposure to injurious dusts or other toxic materials, a separate room for the eating of meals must be provided, if no canteen exists. The requisite floor area of such a room should be based on an allowance of 8 sq. ft. per person for any number of persons up to a total of 25 using the room at one time. Posters displayed at suitable positions throughout the works should remind employees to wash their hands before proceeding to take their meals, for reasons æsthetic as well as those of health. For persons handling toxic materials, the pre-meal wash should be made compulsory, facilities being provided adjacent to the place of working as well as the usual washing facilities.

Cleanliness in working is merely one aspect of good housekeeping at a chemical works. There must likewise be attention to such matters as that of keeping gangways plainly defined and free from obstruction. From the constructional aspect, those places where employees commonly walk should have a floor of anti-slip material. Wood floors, moreover, must be kept free from protruding nails, splinters, loose boards, and uneven parts; a hole must be immediately repaired. Spaces beneath benches and stairways should be inspected at regular intervals to see that they do not harbour refuse or waste of any kind; so also should cupboards with solid panel doors which are not often opened. Oily rags and waste must be kept in covered metal containers; the danger of outbreak of fire from this source is not to be disregarded, for it is a serious menace. Lockers or special racks must be provided for the storage of tools; the tools are then out of the way of causing an accident, and they may quickly be found when needed.

Dismantled or inactive equipment should also be moved to a safe place of storage, and not left standing in a position where it may cause obstruction. Any tendency for a pile or dump of "plant junk" to accumulate should be stopped as soon as it becomes evident, irrespective of what may be said in favour of the occasional utility of such junk. Plant parts which have been discarded do not improve by lying idle, exposed to conditions of corrosion and further mechanical damage, and when suddenly pressed into service for temporary use they can be the primary cause of serious accidents.

J. H. Sankey & Son, Ltd., Ilford, Essex, have issued a revised edition of the leaflet describing their Super Acid-resisting Cement, which is being increasingly used in many ways. The special properties claimed for this cement are that it sets in 12 hours to porcelain-like hardness; resists all acids with the one exception of hydrofluoric; withstands temperatures up to 1200° C.; is water-resisting; has exceptional tensile strength; and can be stored any length of time without deterioration. Free copies of the leaflet are obtainable on application to the company.

Patent Law Reform

Joint Chemical Committee's Memorandum

THE *Memorandum on Patent Law Reform*, prepared by the Joint Chemical Committee on Patents, consisting of representatives of the various chemical bodies interested, has now been published in a single handy volume, and is available from the Association of British Chemical Manufacturers, 166 Piccadilly, London, W.1, price 3s. post free. Part I of this memorandum was submitted to the Board of Trade Patents Committee in September, 1944, while Part II, covering the wider aspects of the subject, was submitted in June this year. For convenience it has been thought desirable to print both parts as a single volume, and to make them available to all interested.

The publication deals in considerable detail with the reforms considered necessary in the Patents Acts, some 50 sections of which are affected. The more important proposals are summarised in the following paragraphs, but for a complete summary, reference should be made to pp. 99-109 of the volume itself. Extended proposals concerning third-party rights are embodied in a supplement. It may be noted that a number of the recommendations put forward have already been adopted, and are included in the Second Interim Report of the Swan Committee (Cmd. 6789; *see* THE CHEMICAL AGE, 1946, *54*, 469).

Part I, it will be remembered, was a comparatively brief document, consisting of a questionnaire covering the principal points at issue, with the Committee's suggested answers, coupled with the dissenting views submitted by Dr. G. H. Frazer on the questions of Licences of Right and the extension of the power of the Comptroller to consider subject matter.

Summary of Recommendations

In Part II a new criterion of subject-matter is developed on the basis that every invention which is patentable must be a novel industrial application of a new discovery. Every inventor who seeks a patent must show that he has contributed some item of new knowledge to the art, and that his invention (which must be a "manner of new manufacture") is based on that new knowledge.

Part II also defines "invention by selection" on the lines of the Maugham judgment as modified by 16 years of practical testing. An inventor must bring himself within the rules for "selection" if there is a prior disclosure or claim of his invention which is not merely a statement of *desiderata* but prescribes, though only in general terms, the substances, agencies or means by which his invention is effected. In these circumstances the requirements for patentability as a selection from the general disclosure or claim are: (a) discovery of a previously unrecognised advantage shown by the selection and not common in the field of the general disclosure or claim; and (b) limitation to a manufacture based on that discovery. In addition there must, as usual, be novelty (the selected members must not have been specifically mentioned before), and adequate description of the invention (*i.e.*, in this case, of the advantage which justifies the selection).

Proposed Definitions

It is also suggested that the scope of "product claims" should be defined as protecting the product when made by the process described or by any process which is non-inventive over it. This would bring chemical inventions into line with other inventions, and if Section 38A (3) were incorporated in Section 27, Section 38A could be cancelled so far as concerns chemical inventions. Definitions of "chemical process" and "chemical invention" are proposed.

A scheme for Empire patents is outlined, but the inherent difficulties of such an arrangement are recognised.

An important modification of opposition procedure is proposed which includes: (a) notification of anticipations without formal opposition; (b) filing of an agreed "Technology of the Case"; (c) limitation of evidence to statements of facts to the exclusion of argument, leaving the cited documents to speak for themselves; and (d) limited extensions of time for filing evidence. Various detailed amendments of Section 11, including the abolition of *locus standi* requirements, are suggested, and a separate section dealing with opposition on the grounds of "obtaining" and "prior user amounting to publication" is recommended.

Freedom of amendment within the scope of the original disclosure is also suggested in Part II. Amendments which enlarge the claims (always within the scope of the original description) should be allowed subject to Third-Party Rights, a new definition of which is proposed.

So far as patent licences are concerned, the sanction of an infringement action should not be available for terms and conditions which are essentially of the nature of trade agreements, and the patentees should not be allowed to assert rights which extend beyond those granted by the Letters Patent. If this principle (which is accepted by the Swan Committee) is carried into effect, the feeble provisions of Section 38 become unnecessary and a stop is put to many "abuses

of monopoly." It is necessary, however, that every assignment and licence be registered and all terms and conditions be disclosed to the Comptroller, who should have power to open them to public inspection where he finds illegal conditions imposed. This power would be a salutary deterrent against the use of patents to impose a system of private commercial law.

Replacement of Section 27 by a new section setting out the Rights and Obligations of a Patentee is recommended.

Among other proposals made in Part II may be mentioned: general right of appeal from all decisions of the Comptroller; companies to be entitled to be sole applicants for patents; power for an applicant to withdraw a complete specification without abandoning the application; extension of provisional rights by post-dating up to six months; list of office citations to be printed at the end of specification; division of applications on initiative of applicant; printing of refused specifications with consent of applicant; general reduction of Patent Office service charges; availability of duplicate of the office search files for public use; revision of Section 29's welding; correspondence with patent agents to be privileged.

Constitution of the Committee

The following were the members of the Joint Committee as constituted for the preparation of Part II of the memorandum:

Association of British Chemical Manufacturers: Mr. C. Hollins (Imperial Chemical Industries, Ltd.; *Chairman*), Mr. E. H. Brittain (The Distillers Co., Ltd.), Dr. G. H. Frazer (Therapeutic Research Corporation of G.B., Ltd.); *Biochemical Society*, Mr. F. A. Robinson; *British Association of Chemists*, Dr. G. E. Foxwell; *Chemical Society*, Professor J. T. Hewitt; *Institution of Chemical Engineers*, Dr. Herbert Levinstein; *Royal Institute of Chemistry*, Dr. J. G. Fife; *Society of Chemical Industry*, Mr. H. W. Rowell. Mr. Allan J. Holden and Mr. H. W. Vallender, of the A.B.C.M., served as Secretary and Assistant Secretary respectively. The chairman, Dr. Levinstein, and Dr. Fife were appointed witnesses to give evidence before the Board of Trade Committee.

Benn Brothers' Annual Meeting

Expansion of Trade Journal Services

MR. GLANVILL BENN, the chairman, presided at the 50th annual general meeting of Benn Brothers, Limited, held at Bouverie House, Fleet Street, London, on August 9. The following are extracts from the chairman's speech.

The accounts reflect the greatly extended operations of the company in the twelve months since the end of the war in Europe. The progress has been achieved despite the severe handicaps common to the business community generally still labouring under the frustrations imposed by the retention of many war-time controls. The continued severe rationing of paper to little more than a quarter of pre-war usage is a brake on the restoration of the full normal activities of the company's 15 trade and technical journals, and on the thousands of commercial undertakings they serve who are striving to rehabilitate their businesses after the upheaval of six years of war. Your journals alone have over 400 British producers of goods waiting to advertise, but whose announcements are shut out for lack of space; and some 3500 firms waiting to subscribe to whom, as yet, copies of the journals cannot be supplied. Add a very high proportion of present advertisers who are waiting for larger advertisement spaces and for additional copies, and some idea is obtained of the retarding influence on trade exercised by governmental restrictions.

There has, however, been one relaxation. A freer allowance of paper for export purposes has made it possible for those of your publications which are wholly for distribution overseas to play the fullest part in aiding the British export drive, and for the rest of the journals to carry, on a far larger scale than in previous years, the message of British manufacturers' goods and services to potential buyers in all parts of the world.

The British Trade Journal and Export World has been enlarged to pre-war size. *Industria Britanica*, which, with its important supplement, *Textil*, is printed wholly in Spanish, is circulating more widely than ever throughout the South American markets, while the Portuguese edition is now restored as a quarterly publication. The inquiry bureau facilities of these journals have been more than doubled during the past year and are rendering invaluable service to British manufacturers and exporters on the one hand, and to overseas buyers of British goods on the other. Similar developments, including the restoration and expansion of our overseas agencies, have taken place and are continuing with all our other journals. Excellent progress has been made by the subsidiary company, Ernest Benn, Ltd., which is again resuming its place among the leading book publishers in the United Kingdom.

Reference is made in the report to the

pleasure felt by the board at the return of our pre-war members of the staff who have been serving in H.M. Forces and the Defence Services. Those of us who have returned during the year are especialy grateful to our colleagues who carried on in Bouverie House throughout the fantastic conditions of London at war, and managed to produce journals week by week or month by month without a break, the reputations and circulations of which stand, thanks to their efforts, higher than ever.

So far I have mentioned some aspects of our activities as publishers. But there is one topic of more general interest that deserves thought. Benn Brothers, Limited, is a typical example of private enterprise. You or your predecessors as shareholders provided the original capital with which the business began. That capital increases or decreases in value in proportion as we, the directors and workers in the enterprise manage its affairs well or badly. All of us stand entirely on our own feet. We receive no subsidy, guarantee, or government support of any kind. On the other hand we are all taxpayers. Nowadays the more efficiently we work, the more tax we pay and the greater becomes Mr. Dalton's contempt for us. You will recall his recent jibe that he had no interest at all in the man who paid 19s. 6d. tax in the £. Evidently he overlooks the fact that most of the men in this very small income group are those whose energy and personal initiative have made them leaders in British industry and commerce.

Burden of Taxation

The following figures may be commended to the Chancellor and to the general public as an illustration of the burden of current taxation on private enterprise generally, and on your business in particular. During the seven years since our annual meeting in 1939 Benn Brothers, Limited, has paid to the Government £167,000 in direct taxation and £97,500 in tax deducted from shareholders' dividends—a total of £264,500. In the same period, shareholders have received a net amount of £107,000 in dividends, while more than £22,000 has been paid in non-contributory pensions and retiring allowances without waiting for Beveridge or other governmental schemes. These results are by no means exceptional. Through the 15 trade journals issued from this House we are in touch with countless businesses all over the United Kingdom. There is reason to believe that if other companies would publish tax figures corresponding to those I have quoted, our record, good as it is, would appear by no means unique.

The great majority of business men, as their records show, are patriotic, law-abiding citizens, who contribute the sinews of war and peace. The present Government's policy of wholesale nationalisation, coupled with a curious shilly-shallying between cajolery and threats towards private enterprise, must inevitably bring a reaction sooner or later in loss of confidence. Already uncertainty about their future has led many business men to adopt a cautious attitude, and to restrict their areas of risk-taking. Before a set-back to trade occurs, is it too much to hope that Mr. Dalton will begin to show a little gratitude and encouragement to the providers of his main sources of revenue?

The report and accounts, together with the dividend recommendations, were unanimously adopted. Sir Ernest Benn, Bart., C.B.E., was re-elected a director; and Cassleton Elliott & Co., were reappointed auditors.

Sir Ernest Benn's Jubilee

At the conclusion of the formal business, Mr. Herbert H. Wardle, on behalf of the staff, made a presentation to Sir Ernest Benn to mark his completion of 50 years of active association with the business. The presentation included a cheque for the Boys' Hostel Association which had its beginnings as a permanent memorial to the late Sir John Williams Benn, the founder 66 years ago of the business of Benn Brothers, Limited.

Bauxite and Oil

New Hungaro-Russian Corporations

THE Hungaro-Russian Bauxite-Aluminium Corporation, which was formed in May, following negotiations between the Hungarian and Soviet Governments, and has since taken over all the main Hungarian bauxite and aluminium mines and plants, has now published its production programme for the next three years. Scheduled output will be 400,000 tons in 1946, 500,000 tons in 1947, and 700,000 tons in 1948.

Since Hungary is the most important producer of bauxite in Europe, and bauxite exports play a great part in Hungarian foreign trade, the new corporation is of considerable importance in the Danubian economy.

Two other Hungaro-Russian corporations have been formed for the exploitation of Hungarian oil resources, the one for prospecting, production, and distilling, and the other for refining and distribution. The activity of these companies will be limited to the left bank of the Danube, and will not affect the Transdanubian oilfields owned by the American Standard Oil Company. The area covered has not yet been thoroughly prospected for oil, but it has been officially announced that there are indications of the existence of rich oilfields.

All these corporations have a capital of which half has been supplied by Russian and half by Hungarian interests.

Personal Notes

SIR JOHN B. LLOYD has resigned from the board of the Anglo-Iranian Oil Co., and MR. F. G. C. MORRIS has been appointed a managing director.

MR. R. BOYLES, formerly secretary of Swift & Co., Pty., Ltd., specialists in industrial chemicals, Sydney, N.S.W., has been appointed a director of the company.

DR. D. J. G. IVES, Ph.D., A.R.C.S., F.R.I.C., has been granted the title of Reader in Chemistry in the University of London in respect of the post held by him at Birkbeck College.

MR. GILBERT RITCHIE, who celebrated his golden wedding last week, has been chairman of the Parozone Co., Ltd., chemical manufacturers, Glasgow, since 1931, having joined the company in 1918.

DR. J. V. N. DORR, M.I.M.M., M.I.Chem.E., has been appointed chairman of the Dorr-Oliver Co., Ltd., in place of Mr. William Russell, M.I.M.M., M.I.Chem.E., who is retiring from that position but continuing as a director.

DR. R. M. BARRER, D.Sc., Ph.D., F.R.I.C., has been appointed to a Readership in Chemistry in the University of London, tenable at Bedford College. Since 1939 he has been head of the chemistry department at Bradford Technical College.

MR. J. F. BYRNE, director of Paines & Byrne, Ltd., has recently returned from America where he has renewed many business contacts in connection with the manufacture of hormones, vitamins, agar, etc. Mr. Byrne speaks highly of the friendly reception extended to him and believes that considerable business, to the advantage of both countries, will result from his visit.

DR. W. E. COHEN and DR. A. MELLER have been awarded the Grosvenor Laboratories Prize for 1945 by the Australian Chemical Institute. Dr. Cohen is principal research officer, Division of Forest Products, C.S.I.R., and Dr. Meller is research chemist with Australian Paper Manufacturers, Ltd. The award was made for contributions to the development of the paper industry.

Obituary

MR. GEORGE HENRY JOSEPH ADLAM, O.B.E., M.A., B.Sc., who died at Wells, Somerset, on July 30, aged 70, had been editor of the *School Science Review* since its inception in 1919 and was Senior Science Master at the City of London School from 1912 until his recent retirement. His many educational textbooks on chemistry have been invaluable in promoting the welfare of school science, a cause which he served with unbounded energy and devotion.

Institute of Metals

Nomination of Officers

THE undermentioned officers will retire from the Council in March, 1947, and, with the exception of the president, are not at that time eligible for re-election in their present capacities: *President*, Colonel P. G. J. Gueterbock; *Vice-president*, Mr. G. L. Bailey; *Members of Council*: Sir Clive Baillieu, Mr. John Cartland, Dr. A. G. C. Gwyer, and Dr. C. Sykes.

To fill the vacancies by these retirements, the Council makes the following nominations. As *President*, Colonel P. G. J. GUETERBOCK, C.B., D.S.O., M.C., T.D., M.A.; as *Vice-president*, MR. JOHN CARTLAND, M.C., M.Sc., director, Fry's Metal Foundries, Ltd., and Eyre Smelting Co., Ltd.; as *Members of Council*: PROFESSOR LESLIE AITCHISON, B.Sc., D.Met., Dept. of Industrial Metallurgy, University of Birmingham; MR. JOHN ARNOTT, chief metallurgist, G. & J. Weir, Ltd.; DR. MAURICE COOK, delegate director and research manager, Metals Division, Imperial Chemical Industries, Ltd.; and MR. A. J. MURPHY, M.Sc., chief metallurgist, J. Stone & Co., Ltd.

Indian Mineral News

New Bureau Established

TO disseminate, in non-technical language, information relating to Indian minerals and fuels, a Mineral Information Bureau is to be set up shortly in India. It will advise both on the processing and on the use of minerals, and will supply data on their availability and their quality for industrial use. It will also help industrialists by carrying out laboratory tests and by recommending technologists for prospecting, surveying, and opening up mineral deposits. The new Bureau will be under the supervision of Dr. D. N. Wadia, who will have the help of the staff of the Geological Survey of India. The Bureau's services will be provided free of charge, though small fees may be levied for special analytical work.

Quarterly Journal

A quarterly journal, entitled *Indian Minerals*, will be published, with Dr. Wadia as editor, to serve as a forum for the discussion of the mineral development of India. While the Geological Survey of India, which has recently been expanded, has maintained a small information and publications section, the new Bureau will be in a much better position to further this important aspect of the country's mineral development by satisfying the growing interest in Indian minerals, both within the country and abroad.

A CHEMIST'S BOOKSHELF

AN INTRODUCTION TO BIOCHEMISTRY. By W. R. Fearon. 3rd Ed. London: Heinemann. Pp. 569. 21s.

At a time when it is the fashion to write specialised books on certain aspects of a science it is most gratifying to find that Professor Fearon has produced a third edition of his well-known textbook *An Introduction to Biochemistry*. This new edition maintains the high reputation established by the author in this field and should serve to popularise a growing branch of chemical science.

For the benefit of those not familiar with the previous editions of this work it may be stated that the book is divided into two parts. The first consists of four short chapters, the purpose of which is to introduce the scope of biochemistry and to lay an elementary foundation of physical and inorganic chemistry, sufficient to enable the reader to follow the material in the second part, which gives an account of the various classes of organic compounds of which living material is composed and the ways in which they are metabolised and excreted.

The whole text has been thoroughly revised and the latest references to important work have been given either in the body of the text or in the very full lists of references at the end of each chapter. Although the book is modestly styled "an introduction," a student with no previous knowledge of the subject should have no difficulty in following original papers after studying the text, so lucid is the way in which the material is explained. The text throughout is well supplied with tables serving to summarise information in a most convenient way, and many diagrams illustrate various processes such as the nitrogen cycle and the relationship of the hæmoglobin derivatives. Clear diagrams such as these are more effective in getting information over than a large quantity of words, and they should be encouraged.

In addition to the general revision of the text, most of the chapters have been expanded by the insertion of new sections and a completely new chapter has been added on Tissue Chemistry, while the chapter on Tissue Respiration now devotes some space to a discussion of the energy exchanges involved in biological reactions. Other major alterations are in the chapter on Nutrients, which has been almost entirely rewritten, and it is interesting to note that at the end is a reproduction of the Recommended Dietary Allowances adopted by the Council of British Societies for Relief Abroad.

A factor which will appeal to more medically-minded readers is that greater attention has been paid to subjects which are of special interest in clinical medicine, among which may be mentioned acid-base balance, blood chemistry and bone formation. The pure organic chemist will likewise find much to interest him, and his attention will be largely centred on such subjects as the carbohydrates, steroids, amino acids, and plant pigments.

Besides the obvious value of this book to the student of biochemistry, much of the contents will be of great assistance to the analytical chemist. Various reactions are given for detecting the presence of such substances as sugars and products of excretion, and in most cases the chemistry of the test applied is explained and the limitations stated. Where a number of qualitative tests depend on the production of colours it is highly desirable that the student and the analyst should have at least some idea of how the colour is produced even if its constitution is uncertain. Some new reactions are described and these include the author's work on the use of methylamine as a reagent for lactose and maltose, and the chloroimide test for uric acid.

This new edition of a now standard work may be confidently recommended not only to the student of biochemistry for whom it is primarily designed, but as a work of reference for organic chemists in general and in particular those engaged in the food and pharmaceutical industries.

G. G. S. DUTTON.

THE SCIENCE AND ART OF PERFUMERY. By Edward Sagarin. London and New York: McGraw-Hill. Pp. 268. $3.

The author of this new and rather unusual book on perfumery is a well-known member of the American Givaudan-Delawanna concern, a fact that ensures a good deal of practical knowledge of the subject and guarantees freedom from the more elementary and familiar errors. Indeed, Mr. Sagarin freely acknowledges his indebtedness to many of his Givaudanian colleagues and additionally to Professor Marston T. Bogert, of Columbia University, Dr. P. G. Stevens, of Yale (who, incidentally, has carried out some interesting recent work on macromolecular musk-odour compounds), and Dr. Eric C. Kunz.

The Science and Art of Perfumery deals mostly with the art, craft, and æsthetics of the subject. It is well written and will undoubtedly afford instruction, entertainment, and (possibly) even inspiration to a wide audience of readers. One could particularly recommend it as "additional reading" for science students, and could readily envisage its encouraging a young B.Sc. to specialise in some branch or other of the highly developed aromatics industry.

Mr. Sagarin, in his deliberate appeal to that increasing section of the general public that likes to "get the hang of the thing" in so far as technical developments are concerned, is careful not to overdo the scien-

tific details. Yet, for all that, the word "science" in the title is amply justified, for the author neither shirks nor scamps the technology of the subject. The broad outlines are all there, deftly and accurately sketched in; and if any reader wants to pursue this or that branch of aromatics at greater length or in profuser detail, well—Mr. Sagarin has painstakingly compiled an extremely comprehensive bibliography.

I sincerely recommend this book to all who may respond to the extraordinary fascination of aromatic substances and their myriad applications. The author will take them from the most primitive uses of perfume and other historical aspects to a stimulating variety of botanical and chemical considerations, and thence to the flowers of the field and the no less fragrant odours of the laboratory. He will reveal literary and economic significances that may surprise them; and for their proper entertainment he will whisk them from age to age and from clime to clime. One chapter ("The Genealogy of a Formula") alone deserves to ensure a place for the book on many a crowded bookshelf—for in this he instructively sets out to explain the presence of each of 24 separate ingredients in a formula for Chypre perfume by the late Felix Cola.

Well done, Mr. Sagarin! Your obvious enthusiasm has proved most infectious, without in any way misleading you into hasty statements or unbalanced expressions of opinion. Knowledge, careful arrangement, wide reading and restraint: all these and other merits characterise this admirable book. I have no adverse criticisms to offer.

G. S. COLLINGRIDGE.

Industrial Safety Gleanings

Organic Silicates

ACCORDING to reports from the laboratories of Carbide and Carbon Chemicals Corp., New York, exposure to methyl silicate vapours under certain conditions of humidity, or to the liquid, may cause a necrosis of the cornea cells of the eye, which progresses long after exposure, is destructive and resistant to treatment, and may even lead to permanent blindness.

Ethyl silicate, on the other hand, has produced no serious damage to the eye, either as a vapour or even when the eyelids of test animals have been filled with the undiluted liquid. On inhalation, the ethyl silicate vapours, like those of all organic solvents, may be toxic. However, widespread industrial experience with this product has shown no evidence that it may cause silicosis or any other serious lesion.

Scientific Glassware

Government Questionnaire

AN Inter-Departmental Committee on the Scientific Instruments Industry has been formed, to deal with problems arising inside the industry. Panels have been set up within the committee to review sections of the industry. One panel has been appointed to recommend what action should be taken to encourage development, to increase production to meet the estimates of existing and potential demands at home and abroad, and, generally, to put the industry on a sound economic basis.

It is essential that this panel shall be provided with up-to-date facts on the present capacity and development plans of all firms in the industry. Accordingly, a questionnaire has been circulated asking for certain details of the production of furnace-blown, pressed, and lamp-blown scientific glassware. Firms who have not received the questionnaire are invited to communicate with the Secretary, Inter-Departmental Committee on Scientific Instruments (Scientific Glassware Panel), Room 700, Portland House, Tothill Street, London, S.W.1. All information given in the questionnaire will be treated as confidential.

Non-Ferrous Metals

Consumption during the Second Quarter

DETAILED figures of consumption of non-ferrous metals in the U.K. during the second quarter of 1946, covering zinc, lead, tin, nickel, cadmium, antimony, cobalt, and manganese, have now been issued by the Directorate of Non-Ferrous Metals. Tables are available, showing consumption of virgin metals and scrap for the various trades. Total figures, in long tons, of the consumption of virgin metal are as under:

	First Quarter 1946	*Second Quarter* 1946
Zinc ...	50,653	51,548
Lead ...	55,426	48,013
Tin ...	5421	6449
Nickel ...	2098	3094
Cadmium ...	127	138
Antimony ...	1490	1274
Cobalt ...	149	224
Manganese	136	149

Consumption of scrap metal in the second quarter, additional to the above, was as follows (in long tons): zinc, 17,559 (including remelted); lead, 29,863 (including lead refined in the U.K. from scrap and home-produced ores); tin, 1822; antimony, 754.

General News—From Week to Week

The telephone service between this country and the U.S.S.R. is now available to Kiev and Leningrad as well as to Moscow.

The resumption of exports of rosin from the U.S.A., though still on a limited scale, has brought about some improvement in the position in this country.

The London quotation for refined platinum is now £20 15s. per troy ounce. This compares with £17 previously (*see* THE CHEMICAL AGE, July 27, p. 96), and follows the recent increase in U.S. platinum prices.

The D'Arcy Exploration Company, which during the war produced from Formby over 6500 tons of crude oil, has extended its operations to Sefton, where work has begun on the drilling of land at Moss Lane, owned by Bootle Corporation.

The site at Wilton on which I.C.I. propose erecting new factories at a cost of £10,000,000, was toured last week by the chairman, Lord McGowan, who stated: "We contemplate many new developments in the chemicals line."

A trade mission from Hyderabad has arranged to build a £1,000,000 factory in India to produce rayon under the supervision of Lansil, Ltd., of Lancaster. Orders worth more than £2,000,000 have already been placed in Britain by the mission.

When fire broke out in the chemical stores at the fireworks factory of C. T. Brock & Co., Ltd., near Hemel Hempstead, last week, it soon spread to other buildings and an explosion occurred. Three men were injured. Employees fought the flames until the arrival of the fire brigades.

Members of a technical mission are shortly leaving Britain on a tour of the Caribbean oil-producing areas, mainly Trinidad, Venezuela, and Colombia, to study the mechanical equipment required in the producing fields and refineries, with a view to increasing British exports. The leader of the mission is Mr. G. R. Bolsover, a director and chief metallurgist of Samuel Fox and Co., representing United Steel Companies.

Imports of synthetic rubber have now stopped, and after October nothing but natural rubber will be used for tyres, Mr. F. D. Ascoli, chairman of the Rubber Growers' Association, stated in London last week. Meanwhile, he said, manufacturers are exhausting existing stocks of synthetic and have decided to press the Board of Trade for the return to a free market as soon as the present agreement with U.S.A. ends on December 31.

Zinc chrome is covered by Specification DTD 377A, issued by the Ministry of Supply (1s.) to supersede No. 377.

Foreign News

The Turkish Government has lifted restrictions on the export of chrome ore.

The recently nationalised chemical plants of Czechoslovakia intend establish one joint representation office in each important foreign country.

The mines of the Erzgebirge Mountains in north-western Bohemia are resuming production again, especially of copper and zinc ores.

The soap industry of Egypt has recently made such progress, it is reported, that when working at full production it can supply the whole of the requirements of Egypt.

A uranium deposit of unexplored proportions has been discovered between Ris and Châteldon, near Vichy, reports Reuter from Paris. The area is at present estimated at one to two square miles.

The Johns Manville Corporation, of America, plans to supervise the manufacture of asbestos products in ten foreign countries, including Great Britain, France, Argentina, and China.

The United Aluminium Works at Randhofen, near Braunau, Austria, built by the Germans during the war and employing 1100 people, have been placed by the American Military Administration under the trusteeship of the Austrian Government.

The production of penicillin in Germany is to be increased, especially in the Hoechst works of I.G. Farben, in order to reduce imports from abroad. It is not expected, however, that the target figure of 1000 units a month will be reached for at least two years.

France's aluminium output rose to 5678 tons in June, as compared with 5432 in May, that of 50 per cent. ferro-silicon increased from 2550 tons to 2900, while electrolytic copper production dropped from 666 to 618 tons. Output (in tons) of lead, zinc, and nickel amounted to 3452 (2039), 2689 (2784) and 84 (45) respectively.

The Allied Control Commission has approved a barter agreement between Austria and Poland which provides for the exchange of Polish coal valued at $3,000,000, zinc valued at $500,000, iron ore, rolled steel products, porcelain and chemical products in return for Austrian agricultural and industrial machinery and tools.

A new Belgian company, the Société Industrielle de l'Aluminium "Sidal," has been registered in Brussels with 52 million francs capital to undertake the production of and trade in metals, particularly light metals and their high-resistance alloys.

The largest German steelworks and armament combine, the Vereinigte Stahlwerke in the Ruhr, is shortly to be taken over by the British authorities, who are reported to be checking up all the foreign assets of the concern.

Polish Production of non-ferrous metals in May included 51,582 tons of zinc ore, 3202 tons of pyrites, 9510 tons of zinc concentrates, 8227 tons of sulphuric acid, 405 tons of sulphur, 4312 tons of zinc, 2131 tons of zinc sheet, 704 tons of refined lead, and nine tons of cadmium.

The directors of the Nitrate Railways of Chile announce that they have received cabled advice that another decree has been signed by the Chilean Government suspending the effects of the decree under which the Chilean State Railways were to take over the Nitrate Railways system (*see* THE CHEMICAL AGE, August 3, p. 151).

The establisment of an Office of Technical Services has been announced by the Department of Commerce in Washington. It will consist of four major units: the Invention and Engineering Division; the Industrial Research and Development Division; the Liberty and Reports Division; and the Technical Industrial Intelligence Division. The head of the new office, Mr. John C. Green, has been in England recently attending the international conference on German patents.

The final official estimate of the 1945-46 Indian linseed crop places production at 369,000 tons and the area planted at 3,376,000 acres, compared with 392,000 tons and 3,465,000 acres last year, states the Indian Trade Commissioner in London. The combined rape seed and mustard seed crop is placed at 910,000 tons and the area at 5,497,000 acres, against 1,034,000 and 5,580,000 a year ago. Crops have generally suffered from drought and the failure of the winter rains, but the condition on the whole is reported fairly good.

As a result of the commercial treaty between Belgium-Luxembourg and Holland, the following exports to Holland of chemical and allied products are provided for, according to *Le Trait d'Union Belge*. Caustic soda and bicarbonate of soda, 12,000 tons; copper sulphate, 4000 tons; sulphate of alumina, 1500 tons; and unspecified quantities of calcium chloride, barium and potassium salts, and hydrochloric acid. In addition, the export of 6000 tons of copper and its alloys, and 400 tons of "other non-ferrous metals" is provided for.

Concentration of fluorite from metals is the subject of the latest report of investigations by the U.S. Bureau of Mines (R.I. 3893). The tests showed that acid-grade fluorite was recoverable by flotation with fatty-acid collectors and further increased recovery was possible by refloating the pilot-plant tailings after thickening or desliming.

Further expansion of the American General Electric chemical department with the formation of a metallurgical division has been announced by Dr. Jeffries, general manager of the Chemical Department. Among the company's well-known products are the permanent magnet material known as Alnico (an alloy containing iron, nickel and aluminium, and generally also cobalt), and Vectolite, the first non-metallic non-conducting magnetic material ever made.

A drug that lay dormant in German laboratories throughout the war is now going into production in the United States as the most potent remedy known for the treatment of malaria, reports the *New York Journal of Commerce*. The Germans, it is stated, did not know of its anti-malarial possibilities. Chemically, it is 7-chloro-4 (4′ - diethylamino - 1′ - methylbutylamino) quinoline diphosphate. Known commercially as "Aralen," the drug is administered in tablet form, and only two tablets being required per week. It does not discolour the skin as do certain other anti-malarials.

Forthcoming Events

September 10-11. Institute of Metals (Autumn Meeting). Institution of Civil Engineers, Great George Street, London, S.W.1. September 10, 2.30 p.m.: Official business, followed by three papers. September 11, 10 a.m.: Simultaneous groups of papers (in Lecture Hall and South Reading Room); 1.15 p.m., Annual luncheon at Connaught Rooms, Great Queen Street, W.C.2. Applications to the Secretary not later than September 1.

Company News

The net trading profit of **Stream-Line Filters, Ltd.**, for the year ended December 31 last was £52,385, as compared with £29,949 for 1944. A second interim dividend of 10 per cent. makes 13 per cent. for the year (same).

At the annual meeting of **Morgan Crucible Co.** last week the chairman, Mr. P. Lindsay, announced that permission had been received to increase the ordinary capital of the company by up to £324,000 by means of an issue of new shares at a premium to be offered to the public with preferential allotment to present stockholders.

Low Temperature Carbonisation, Ltd., show a trading profit of £81,500 (£51,445) for the year ended March 31, and are paying an ordinary dividend of 6 per cent. (4 per cent.).

Reduction of the capital of **British Tar Products, Ltd.,** has now been confirmed by Mr. Justice Evershed. Repayment of 10s. for each £1 preferred ordinary and ordinary (2s. 6d. for each 5s. unit) will be made on September 7. Meetings will be held at the Mayfair Hotel on September 10, to consider cancelling the preferential rights of the £8915 preferred ordinary stock, and to convert this stock into ordinary.

New Companies Registered

E. R. G. Goffe, Ltd. (415,961).—Private company. Capital £500 in £1 shares. Manufacturers, importers and exporters of and dealers in chemicals and substitutes thereof, etc. Directors: R. G. Goffe; N. Goffe; H. G. Eggleton. Registered office: 8 Laurence Pountney Hill, E.C.4.

Silverson Machines (Sales) Ltd. (415,969). Private company. Capital £100 in £1 shares. Dealers in and manufacturers of machines for the chemical and allied trades. Subscribers: K. J. Mallet; M. Sellars. Registered office: 11/12 Finsbury Square, E.C.2.

K. B. Products (Birmingham) Ltd. (416,165). — Private company. Capital, £1500 in £1 shares. Industrial research chemists, manufacturers and factors of polishing compounds, etc. Directors: A. E. Vellere; N. Bowen; P. S. Taylor. Registered office: Barclays Bank Chambers, South Road, Smethwick, Birmingham, 41.

Paint Removers, Ltd. (416,371).—Private company. Capital £10,000 in £1 shares. Manufacturers of and dealers in chemicals and other substances for the removal of paint, oil, grease, ink, stains and blemishes generally, etc. Subscribers: E. W. Poole; C. B. Sawkins. Secretary: E. C. Wingrove. 24 Ryder Street, St. James', S.W.1.

Britalia, Ltd. (415,900).—Private company. Capital £1000 in £1 shares. Manufacturers of and wholesale and retail dealers in chemicals, drugs, fertilisers, etc. Directors: W. O. Morgan; A. W. Anderson; J. G. Fairweather; A. H. White; P. M. Morgan. Registered office: 196 High Street, Bromley, Kent.

Anglo-American Chrome and Plating Company, Ltd. (416,033).—Private company. Capital £4000 in £1 shares. Electro-Chemical engineers. Directors: A. M. H. Van Collis; R. C. O. Reynolds; J. A. Vence-Gunstane; M. B. Collis; I. M. V. Gunstane. Registered office: Collingwood Works, Camberley, Surrey.

Fylde Laboratories, Ltd. (415,918).—Private company. Capital £4000 in £1 shares. Manufacturers of and dealers in chemicals, etc. Directors: S. Vernon; W. H. Goode. Registered office: 1 Canal Street, Deepdene, Preston.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LAFARGE ALUMINOUS CEMENT CO., LTD., London, W. (M., 17/8/46.) July 23, £12,500 debentures, part of a series already registered. *£10,000. January 11, 1946.

Satisfactions

ACME METAL WORKS (1921), LTD., Brentford. (M.S., 17/8/46.) Satisfaction July 25, of debentures registered March 27, 1931, to the extent of £1000.

UNITED BRASS & COPPER WORKS, LTD., Hull. (M.S., 17/8/46.) Satisfaction July 25, of mortgage registered February 5, 1944.

Partnership Dissolved

E. N. LEWIS & TAYLOR (Robert Walter Cruickshank TAYLOR and Thomas Cecil VENTERS), chartered patent agents, 4 Berridge Street, Leicester. June 30, 1946.

Company Winding-Up Voluntarily

FORCE CRAG MINE, LTD. (C.W.U.V., 17/8/46.) By Extraordinary Resolution, August 2. Herbert James Rigg, of 22 Lowther Street, Carlisle, Cumberland, appointed liquidator.

Chemical and Allied Stocks and Shares

STOCK markets showed a rising trend, and although the volume of business was again only moderate, there were a number of strong industrial features. Imperial Chemical, which have been particularly active since news of the proposed £10,000,000 plant extensions, came into further prominence with a jump to 48s. 9d. (the highest level ever touched by the £1 units) attributed partly to Indian buying. Profit-taking later reduced the price to 46s. 9d.

which, however, represents a good rise on balance. Dunlop Rubber were also prominent, advancing to 78s. 9d. (before reacting to 76s. 9d.) on the prospect of a lower price for rubber next year if the proposals of the chairman of the Rubber Growers' Association for a return to a free market for the commodity are carried out.

Reflecting the general market tendency, the units of the Distillers Co. were firm at 139s., with Turner & Newall 90s., and United Molasses 54s. Borax Consolidated deferred ordinary at 47s. 6d. strengthened on the debenture conversion operation. British Aluminium were higher at 44s. 3d. on talk that there may also be a debenture conversion in this case, while Levers moved better at 53s. 9d. In other directions, Imperial Smelting at 20s. 3d. responded to hopes that the company may benefit from the new tax agreement with Australia. B. Laporte remained at 100s., Fisons were 60s., British Drug Houses 57s., Burt Boulton 26s. 3d., and Greeff Chemicals Holdings 5s. shares 13s.

Iron, coal, and steel shares remained in favour on the view that current prices, which show attractive yields, are probably undervaluations, despite nationalisation. The actual basis of compensation for shareholders in individual companies may take two years or more to be finally decided, and meanwhile the assumption in the market is that in most cases dividend payments are likely to be maintained. Only certain sections of the iron and steel industry are to be nationalised, and it is being suggested that shares of companies outside the Government's projects offer possibilities of higher dividends in due course. Elsewhere, British Oxygen have strengthened to 100s., British Plaster Board were 35s. 3d., and Associated Cement 71s. Low Temperature Carbonisation 2s. shares further improved to 3s. on the higher dividend and hopeful views of prospects of some sections of the business outside the threat of nationalisation. After an earlier rise, Triplex Glass showed a partial reaction to 42s. Shares of companies connected with plastics benefited from the better market tendency, De La Rue improving to £11⅛, while British Industrial Plastics 2s. shares were 7s. 6d.

The prospect of increased demand for the company's products attracted further attention to Babcock & Wilcox, which strengthened to 64s. 6d., while International Combustion shares were £9½, and Ruston & Hornsby rallied strongly to 62s. 3d. after moving back to 61s. Dorman Long have been prominent with a further rise to 28s. Guest Keen at 39s. 3d. were again higher, as were Stewarts & Lloyds at 50s. 6d., and William Cory moved up to £5. Shipley were 36s. 3d., and Staveley 49s., while following the meeting, Thomas & Baldwins 6s. 8d. shares moved up to 11s. 3d

Courtaulds and British Celanese have been active around 57s. 3d. and 37s. respectively. Among other textiles, Bradford Dyers moved up to 24s. 9d., with Fine Spinners 24s. 9d., Calico Printers 23s. 10½d., and Bleachers 14s. 7½d. also better. Boots Drug continued firm at 63s. 9d., and Sangers at 33s. 9d. remained under the influence of the higher payment. Griffiths Hughes were 60s. 6d., and Aspro shares 39s. on higher dividend talk. Beechams deferred improved to 27s. 3d. Oil shares failed to hold earlier gains, Shell easing to 93s. 9d. after 94s. 4½d., but Trinidad Leaseholds and other shares of Trinidad producers were better in response to the higher American oil prices.

British Chemical Prices

Market Reports

A MODERATE inquiry has been circulating on the London general chemical market for the majority of the industrial chemicals, and actual bookings during the week have been on a better scale than might have been expected during the early part of August. There has been a good flow of orders for shipment with a considerable volume as yet unplaced owing to supply conditions. The potash products section continues to be rather tight, with the possible exception of permanganate of potash, for which a steady inquiry is reported. There has been no change of importance in the soda products, and values remain firm. In other directions formaldehyde is a strong market, while arsenic and acetone continue to be in good call. The red and white leads are finding a ready outlet and the output of all paint raw materials is quickly absorbed. Acetic, oxalic, tartaric, and citric acid are all active on a strong demand. Very little of note can be reported among the coal-tar products, which display a firm undertone.

MANCHESTER.—Rather busier conditions have been reported this week on the Manchester chemical market. Industrial users in Lancashire and the West Riding of Yorkshire, including the cotton and wollen textile branches, are taking fairly good deliveries under contracts, and in this respect the market has been less under the influence of seasonal conditions than it was a week ago. New inquiry on both home and export accounts has also been more in evidence. In fertiliser materials a certain amount of buying for forward delivery has been reported.

GLASGOW.—Little change can be reported in the state of the Scottish heavy chemical market either for home or export trade. Considerable volume of business has been transacted during the week in all classes of chemicals. Prices show a distinct tendency to increase in nearly all grades. The demand continues to exceed supplies by a considerable margin.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Applications for Patents

Adhesives.—Ciba, Ltd. 20829-30.

Piperidyl ketones.—Ciba, Ltd. 20898-9.

Binding agents.—Ciba, Ltd. 20960.

Thioplasts.—Cie. de Produits Chimiques et Electrométallurgiques Alais, Froges et Camargue. 20920.

Dichlorethylene.—Cie. de Produits Chimiques et Electrométallurgiques Alais, Froges et Camargue. 20921.

Hydrocarbons. — Cie. Française de Raffinage. 20668-9.

Aromatic hydrocarbons.—Cie. Française de Raffinage. 20734.

Butane isomerisation.—Cie. Française de Raffinage. 21169.

Dyestuffs.—J. P. Cunningham, D. Manlove, R. J. Loveluck, and I.C.I., Ltd. 20778.

Polymerisation of styrene.—Distillers Co., Ltd., G. P. Armstrong, R. R. Smith, and J. J. P. Staudinger. 20887.

Lubricating grease.—Dow Chemical Co. 21181.

Fluid-flow control valves.—E. J. Drayton. 20646.

Metal electrodeposition.—E. I. du Pont de Nemours & Co. 20465.

Polymers.—E. I. du Pont de Nemours & Co. 20878.

Interpolymers.—E. I. du Pont de Nemours & Co. 21117.

Alkoxy-substituted esters.—E. I. du Pont de Nemours & Co., and R. E. Brooks. 21123.

Insect repellents.—E. I. du Pont de Nemours & Co., and A. Dreyling. 20569.

Mono- and di-ethanolamine.—E. I. du Pont de Nemours & Co., and W. F. Gresham. 21118.

Ethylamines.—E. I. du Pont de Nemours & Co., and W. F. Gresham. 21120-1.

Nitriles.—E. I. du Pont de Nemours & Co., and W. F. Gresham. 21122.

Polymers.—E. I. du Pont de Nemours & Co., and C. J. Mighton. 20571.

Bleaching cellulosic materials.—English Cellulose Derivatives, Ltd., and G. Ullmann. 20947.

Insecticides.—A. M. Ernst, and J. H. Meijers. 21187.

Magnesium.—R. Fouquet. 21134.

Dyestuffs.—D. Fysh, A. S. Gomm, J. C. Harland, and I.C.I., Ltd. 20777.

Organic compounds.—O. Gaudin. 21202.

Thiazoles.—W. N. Haworth, and L. F. Wiggins. 20721.

Penicillin salts.—Hoffman-La Roche, Inc. 21103.

Water gas.—Humphreys & Glasgow, Ltd., and I. H. Phillipps. 21188.

Light alloy bases.—G. W. Hynes. 21060.

Adhesives.—Imperial Chemical Industries, Ltd. 20876.

Metallic halides.—W. D. Jamrack, and I.C.I., Ltd. 20567.

Ammonium thiocyanates.—Koppers Co., Inc. 20642.

Ethyl naphthalene.—Koppers Co., Inc. 20643.

Treatment of coke-oven gas.—Koppers Co., Inc. 20644.

Coffee extracts.—S. A. Laboratoires Medial. 20518.

Antibiotic production.—E. Lilly & Co. 20799.

Penicillin.—E. Lilly & Co. 20987.

Cleansing, etc., agents.—J. Malecki. 20989.

Synthetic resins.—Manchester Oxide Co., Ltd., V. E. Yarsley, P. Krug, and J. H. Clayton. 21075.

Liquid fuels.—G. E. Mavrodi (J. Argani). 21183.

Explosives.—G. E. Mavrodi (J. Argani). 21184.

Soaps.—G. E. Mavrodi (J. Argani). 21185.

Hormones.—Merck & Co., Inc. 21046-56.

Citric acid.—Merck & Co., Inc. 21186.

Refining of metals.—Mond Nickel Co., Ltd., A. R. Raper, and S. J. R. Fothergill. 20948.

Organic compounds.—Monsanto Chemical Co. 20598-20601. 20891.

Filtration apparatus.—Paterson Engineering Co., Ltd., and E. W. Baily. 20495.

Luminescent materials.—Philips Lamps, Ltd., and A. J. Lister. 20736.

Liquid cooling apparatus.—R. Searle, F. F. Briginshaw, and A. E. Hefford. 20498.

Pigments.—F. G. Smith. 20731.

Separation of fatty oil substances.—Texaco Development Corporation. 20758.

Treatment of nylon.—Tootal Broadhurst Lee Co., Ltd., R. P. Foulds, and W. H. Roscoe. 21076.

Vitamin-containing compounds.—United Domestic Industries, Ltd., E. Kascher, and R. C. Peter. 20632.

Fluid mixing devices.—Walker, Crosweller & Co., Ltd., and C. L. Barker. 20685.

Metal derivatives.—Ward, Blenkinsop & Co., Ltd., K. T. Chapman, and P. P. Hopf. 20716.

Chemotherapeutic compositions.—Westbury Chemical Co., Inc. 20596.

Amides.—Algemeene Kunstzijde Unie N.V. 21963.

Methylol melamine products.—American Cyanamid Co. 21921-7.

Purifying glycerine.—American Cyanamid Co. 22042.

Allyl derivatives.—British Resin Products, Ltd., E. M. Evans, and H. Thurston-Hookway. 21917-8.

Resinous compositions.—British Resin Products, Ltd., E. M. Evans, and J. F. Williams. 22285.

Coating compositions.—British Resin Products, Ltd., E. M. Evans, E. M. Riley, and L. R. Anthony. 22314.

Electro-plating, etc., processes.—British Thomson-Houston Co., Ltd. 22077.

Luminescent material.—British Thomson-Houston Co., Ltd. 22190.

Charcoal.—L. J. Burrage, W. O. Whitaker, and I.C.I., Ltd. 22300.

Sulphur dioxide.—Giba, Ltd. 22094-5.

Vat dyestuffs.—Giba, Ltd. 22307-8.

Grinding of minerals.—Derbyshire Stone, Ltd., and J. W. Hobday. 22441.

Vinyl ethers.—Distillers Co., Ltd., P. L. Bramwyche, and M. Mugdan. 21919.

Polymers.—E. I. du Pont de Nemours & Co. 22035.

Polymeric materials.—E. I. du Pont de Nemours & Co. 22301-2.

Fungicidal compositions.—E. I. du Pont de Nemours & Co., W. S. Hinegardner, and J. F. Walker. 22036.

Coating materials.—E. Eckbo. 22539.

Treatment of magnesium.—C. H. R. Gower, and E. Windsor-Bowen. 22583.

Treatment of aluminium.—C. H. R. Gower, and E. Windsor-Bowen. 22584.

Amides.—R. M. Hughes (J. R. Geigy, A.-G.). 22414.

Ammonium phenoxides.—Imperial Chemical Industries, Ltd. 22304.

Coating compositions.—Imperial Chemical Industries, Ltd. (Canadian Industries, Ltd.). 22538.

Tar distillation.—International Furnace Equipment Co., Ltd., and L. Bailly. 22428.

Producer gas apparatus.—International Furnace Equipment Co., Ltd., and L. Bailly. 22429.

Pentaerythritol.—H. Jackson, K. J. C. Luckhurst, and I.C.I., Ltd. 22537.

Inks.—Lawes Bros., Ltd., L. F. W. Lawes, and C. A. Redfarn. 22377.

Penicillin.—E. Lilly & Co. 22087-8, 22144.

Liquid level measuring.—Liquidometer Corporation. 22169.

Liquid delivery apparatus.—Machinery Engineers & Designers, Ltd., A. Askey, and E. W. Burton. 22524.

Writing fluids.—H. G. Martin. 22534.

Scouring of wool.—Mathieson Alkali Works. 22417.

Chemical compounds.—Merck & Co., Inc. 21981, 22455.

Casein threads.—N.V. Onderzoekingsinstituut Research. 22278.

Purified aluminium.—National Smelting Co. 22167.

Salicylanilide preparations.—Nederlandsche Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek. 21965.

Hormones.—Nova Terapeutisk Laboratorium A/S. 22577-8.

Ion-exchange processes.—Permutit Co., Ltd. 21952.

Decomposing calcium.—D. Plumbridge. 22465.

Mineral, etc., washing machines.—A. Ratcliffe, G. W. Talbot, and I.C.I., Ltd. 22536.

Cellulosic products.—Rayonier, Inc. 22418.

Preparation of alloys.—Régie Nationale des Usines Renault. 22567-8.

Treatment of magnesium.—Régie Nationale des Usines Renault. 22569.

Metallic carbides.—Régie Nationale des Usines Renault. 22279.

Hard alloys.—Régie Nationale de Usines Renault. 22280-1.

Flux coated electrodes.—A. T. Roberts. 22449.

Pinacols.—Roche Products, Ltd. 22405.

Alanine.—Roche Products, Ltd. 22406.

Tertiary carbinols.—Roche Products, Ltd., A. L. Morrison, and H. Rinderknecht. 22407.

Pyridyl-3-carbinol esters.—Roche Products, Ltd. (Hoffman-La Roche & Co., A.-G.). 22446.

Chemical solutions.—J. D. Main-Smith. 22469.

Plastic materials.—G. T. Theobald. 22473.

Metallurgy.—M. J. Udy. 22416.

Organic acid compounds.—Ward Blenkinsop & Co., Ltd., and G. G. Pritchard. 22434.

Treatment of textiles.—Ward Blenkinsop & Co., Ltd., H. G. Dickenson, and P. P. Hopf. 22435-7.

Soap cooling, etc.—E. T. Webb, and Baker Perkins, Ltd. 21942.

Casting of molten substances.—Williams & Williams, Ltd., and W. D. Strachan-Smith. 21938, 22339.

Complete Specifications Open to Public Inspection

Photographic developers. — General Aniline & Film Corp. January 27, 1945. 34021/45.

Colour developers comprising arylsulphonhydrazides.—General Aniline & Film Corp. January 26, 1945. 1265/46.

Coloured layers, especially photographic layers.—Gevaert Photo-Producten N.V. May 22, 1941. (Divided out of 11280/46.) 16585/46.

Production of mono esters of ascorbic acid.—Hoffmann-La Roche, Inc. May 11, 1942. 15213/43.

Conversion of hydrocarbons.—Houdry Process Corporation. January 26, 1945. 2161/46.

Mineral glue.—J. Kemp. May 15, 1943. 19962/46.

Porous metal layers.—Mallory Metallurgical Products, Ltd. January 29, 1945. 10179/46.

Extraction of technically valuable products from emulsions, sludges, slurries, pulps, mashes, ground seeds and fruits and solid-water mixtures, by means of solvents. —J. W. McGregor & Sons, Ltd. January 27, 1945. 1446/46.

Extraction of wool-grease (or fats) and soap from wool scourers' liquors (or similar trade wastes) and the purification of the liquors for re-use.—J. W. McGregor & Sons, Ltd. January 27, 1945. 1447/46.

Aqueous non-alcoholic vanillin-containing flavouring composition.—Salvo Chemical Corp. January 25, 1945. 33600/45.

Electrical purification of gases.—Soc. de Purification Industrielle des Gaz. April 1, 1941. 19891/46.

Refining refractory carbides.—Soc. le Carbone-Lorraine. August 4, 1941. 19890/46.

Application of coatings of metals or metallic alloys.—Philips Lamps, Ltd. May 23, 1942. 17288/46.

Vulcanised furfuryl products.—J. B. Pierce Foundation, Inc. January 13, 1945. 34254/45.

Polymerised furfuryl alcohol plastics.—J. B. Pierce Foundation, Inc. June 13, 1945. 34255/45.

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